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DR. BERNHARD E. FERNOW

Dr. Bernhard E. Fernow

In the death of Dr. B. E. Fernow the country has lost one of the great builders of forestry. Because of his long service in forestry and because of his achievements, he was appropriately called the Dean of American Forestry. He laid the first foundations of forestry in this country, the early technical literature was from his pen, the publication of this Society, in another form, was established by him. He was one of the organizers of the American Forestry Association, and was the director of the first high grade forest school. As an organizer, an administrator, an author, and an educator, Dr. Fernow's talents counted large in the pioneer work of forestry, and enabled him to make his great contribution to American forestry.

Dr. Fernow came to this country in 1876 and soon entered the field of private forestry. Almost immediately he undertook to inaugurate a public movement in forestry. He was prominent in establishing the American Forestry Association in 1882 and was the editor of its first publications. Four years later he was appointed Chief of the Division of Forestry in the U. S. Department of Agriculture—a position which he held for twelve years. During his service in Washington he carried on a vigorous campaign of public education, initiated research work of importance, issued many publications of great value and influence, and by his constructive proposals prepared the groundwork for the basic legislation governing the administration of the National Forests.

In 1898 he founded the College of Forestry at Cornell, the first of the collegiate forest schools. When the work of that school was interrupted he became head of the Department of Forestry at the University of Toronto, where his influence was very great in advancing the cause of forestry in Canada.

As is the case with all pioneers of important undertakings, Dr. Fernow often had to meet criticism and opposition and there were inevitably differences of opinion in regard to various public questions. He was a man of the highest ideals and he courageously and persistently fought for them. Increasingly his achievements have gained well merited recognition by the profession and throughout this country and Canada. He was a man of strong personality and he has always counted upon a host of loyal and devoted friends.

The Society of American Foresters owes to Dr. Fernow a great debt of gratitude for his work in building up the Journal and for his many contributions to the Society's activities. Dr. Fernow lived to see some of the fruits of his labors. As the years pass and our work becomes more effectively established, his services will be remembered with appreciative gratitude as responsible for the inauguration of the first forestry work in the country.

The members of the Society of American Foresters deeply mourn the death of Dr. Fernow, and they take this means of expressing to his wife and family the sympathy that is in the hearts of all.

HENRY S. GRAVES,
GIFFORD PINCHOT,
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JOURNAL OF FORESTRY

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*The Society is not responsible, as a body, for the facts and opinions advanced
in the papers published by it.*

IMMEDIATE OBJECTIVES OF THE SOCIETY

BY RALPH S. HOSMER

President

The Society of American Foresters rounds another mile post with the expectation that 1923 will be a year marked by accomplishment. When we look back over the past 35 years we cannot but be encouraged by the progress that has been made in the development of forestry in America. But this should not blind us to the large and complex problems that still press for solution. The Society has laid upon it certain very real and definite obligations. Only by united team play can we hope to take full advantage of the opportunities for service that are open to us.

The Society of American Foresters is recognized as representing the profession of forestry in the United States. It now numbers over 800 professionally trained men. It is in sound financial condition. It is prepared to grapple with the tasks that properly belong to it. The purpose of this statement is to indicate certain of the things which at this time should have the active support of every member of this professional body.

First in importance is that the Society unitedly support the expansion of the national forest policy. Up to the time of the War the dominant idea was to establish and develop our National Forests on a secure and permanent foundation of proper forest management. There must be no retrogression from what has so far been accomplished. But during the last four years it has become increasingly evident that another chapter must be added to that policy, one dealing with the wise use of the forest lands that are in private ownership. Out of the many discussions has come the decision that the right course to pursue at this time is to get behind a constructive program which emphasizes the few essential things as to the necessity of which there is general agreement.

Such a program has been prepared by the Forest Service. It omits the controversial elements and puts the stress on these five items: (1) Forest fire prevention; (2) increases in the area of public forests—National, State and municipal; (3) reforestation of non-agricultural land through cooperation between Federal and State agencies in the procuring and distribution of plant material; (4) increased assistance to farmers in reforestation and in the care of their woodlands; and (5) forest investigation and research, especially through the establishment and adequate maintenance of forest experiment stations. This is a program that all foresters should be able consistently and gladly to support. The Society should stand strongly behind it in every way. To help to put it into effect should be our first duty.

By no means does the program outlined include all that waits to be done to bring about the general practice of forestry in this country. It is but a start. But it is a good start, and will pave the way for more intensive development later. For the time being other things can wait. The moves enumerated must be made first and at once. From the standpoint of the Society one of the most satisfactory features of the present Forest Service program is that it has the very general endorsement of the profession. In supporting it the Society can at last act practically as a unit.

It seems appropriate here, for a moment, to go outside of strictly Society affairs because of the bearing which the work of a closely allied forestry organization has on the question of a national forest policy. The adoption and proper execution of any public policy depends on public opinion. Once the people of this country really appreciate the full significance of the forestry problem, there will be no question of adequate support of forestry measures. But to be effective public sentiment must be based on a correct understanding of the actual facts. There is need for popular education in forestry, a work that can best be performed by the National and the State forestry associations. Under its recent reorganization, and with Col. Henry S. Graves as President, the American Forestry Association provides the most important channel through which such work can be carried on. That Association now deserves and should receive not only the backing of the Society of American Foresters as a body, but of each of its individual members. The membership list of the American Forestry Association does not include as many foresters as it ought. Here is one way in which the members of this Society can render timely and effective aid, at a period when it will most count.

The activities of the Society of American Foresters can to good advantage be expanded and increased. There should be closer relations between the several sections. An interchange of notes regarding matters that are receiving special attention in each Section could not fail to be suggestive. This might even, in some cases, be just the stimulus needed to bring about action of similar character in another Section. New Sections might well be organized in two or three parts of the country, where at present none exist.

One of the highly important functions of the Society is the work done through its standing and special committees. At the annual meeting in Boston several reports were submitted that in due course will appear in the *JOURNAL*. Several topics were there suggested as deserving the attention of the Society. As one result new committees are being named: to study and report on Interest Rates in Forestry; to collect material dealing with the historical development of forestry in the United States, so that knowledge of the various steps leading up to important events may not be lost; and to ascertain how the Society can cooperate to the best advantage with other organizations representing closely related activities. Other committees that are continued are those on Standardization of Forest Fire Protection Measures and Equipment, on Sites, and on Education in Forestry.

The responsibility for what is accomplished by the Society depends upon what the members of the committees do individually. Service of this sort means real work, but it is a duty that should not be avoided. Particularly desirable is it that the several Sections continue and extend the practice of referring to local committees the study of the specific forest problems local to each region. There are plenty such, in every branch of forestry. The discussions that follow the presentation of proposals that have been carefully formulated do more than perhaps any other one thing to center attention on the problem in question and to point the way to its solution. Incidentally, too, there is no better way to make Section meetings live and vital professional gatherings.

Every member of the Society should bear in mind that the members of the Council and the chairmen of all committees are ever ready to receive suggestions and comments from any source that will further the work in hand, lead to the inauguration of new projects, or strengthen the Society as a whole. From the very fact that most of the work of the Society must be carried on through correspondence, suggestions and comments by any member are in order at all times.

The JOURNAL OF FORESTRY can be made to take an even more important place than it now holds in the field of forestry in America. The ideal should be kept constantly in mind by bringing it, when funds permit, to the point of twelve issues a year.

The Society of American Foresters should have a larger membership than it now does. Many professional foresters who are graduates of recognized forest schools and who are making good in forestry work are not yet on the roll. Every member of the Society, and particularly the officers of the Sections, should feel it to be a part of his duty to see to it that applications from eligible candidates are transmitted to the member of the Executive Council in Charge of Admissions. The machinery of that branch of the Society has been simplified, so that admissions are now handled with no undue delay. It is of course self-evident that the more members the Society has the better will be its financial position and consequently its ability to forward the work it has in mind.

It is further to be hoped that during this year the number of corresponding members of the Society may be increased by the addition of representative foresters of other countries. Many of the problems of forestry are international in scope. It would be of mutual benefit were more intimate relations established between American foresters and their conferees in the profession in certain of the countries of Europe.

In this connection the request may pertinently be made that every member of the Society cooperate with Col. Graves in the compilation of a Directory of Foresters that is now going on under the auspices of the Yale School of Forestry. A circular letter has been sent out generally. Should any member of the Society have failed to receive one, he would do well to communicate with Col. Graves at once.

It is sometimes said that it is the fault of the foresters themselves that more rapid progress has not been made in this country in recent years. There may be some truth in this assertion. If so, it should be but an incentive to increased endeavor. The problems of today may be difficult of solution, but they can offer no greater obstacles than did others in the past which have already successfully been overcome. The spirit in which to meet those which lie ahead is that of cooperation and team play. Let every man act on the assumption that the problems facing the Society and the profession are his problems, and that he has a personal part to play in their solution.

ETHICS OF THE FORESTRY PROFESSION¹

BY THEODORE S. WOOLSEY, JR.

Consulting Forester

A few weeks ago I listened to a sermon on "Loyalty" by Bishop Manning of New York. He defined loyalty as meaning "faithfulness in all relations and obligations of life, faithfulness to God and to our fellow men." All of you will admit that the ministry of all professions stands first in ethical standards, in idealism, and in the absence of self interest. The ministry deals with a human being's life, normally extending from 50 to 70 years. The forester's work has its climax 60 to 200 years from now. *In both professions the fruits of present endeavor do not usually ripen until after the teacher has passed away.*

By adopting forestry as a life task most men have shown that they are interested in the work rather than in a mere living and a job. As you go out to take up your professional career, you must show loyalty to forestry ideals. There will be many temptations to act as if you had never studied the science of continuous forest production, and in the final analysis your intent and your conscience must determine whether you have been true or false. I, for one, believe in allowing a broad interpretation as to whether a man is following out these ideals or not. Under the extensive forest conditions existing in the United States, the forester may with propriety make compromises between the strict dictates of forestry ideals and the requirements of existing economic conditions.

In considering the ethics of any profession, we must admit that mere rules will not suffice. The ethical standards of the profession must be built up on high standards of actual conduct. We must recognize that the real basis for most professional codes is virtually following the "golden rule" and that "honesty is the best policy." It is not surprising that the National Engineering Societies decided that "no gentlemen needed a code of ethics, and that no code of ethics would make a gentleman out of a crook."

¹ Address delivered before the New York State College of Forestry, February 6, 1923.

Those interested in this subject should read "The Ethics of the Professions and of Business" in the May, 1922, number of the Annals of the A. C. of P. and S. C.

Now the ethics of personal conduct in forestry may be divided into two divisions; for those in *public service* and for those in private employment.

You will at once admit that the State and Federal public services demand that their employees be *honest, industrious, sober, and courteous*. It goes without saying that the forester in public employment should not endeavor to secure advancement through politics, that he should not falsify his diary, and that there should be no fiscal irregularities for personal gain. I recall 10 years ago being told by a man in public employ that it cost him nothing to travel with his wife. They both slept in the same lower berth, and he claimed that two people could dine in the dining car at practically the same cost as for one. Consequently, he often took his wife with him on his professional trips. A few years later I heard a prominent engineer in Paris state that he had just met a trans-Atlantic boat, to bring his wife to Paris and to meet some members of his board of directors. He was a man that was not governed by a book of fiscal regulations, but simply by high business standards, and in this particular trip, to which I have alluded, he paid one-half the expenses out of his own pocket and charged half to the company. If you analyze some of the gossip in regard to liberal expense accounts allowed by private corporations, you will generally find that there have been gross exaggerations and that the great corporation is just as intent on a strict observance of high standards as any public service.

There is always a special danger where the individual tries to cut red tape and where he commits an irregularity in order to accomplish good. The public servant must closely observe the letter of the law. I recall that when President Taft came into office a law officer was placed in each western district office of the U. S. Forest Service. This was to correct a certain liberality of interpreting the public law that had crept in during the past administration; for example, if a man owed one hundred dollars for cutting timber illegally on the public domain, and he personally deposited \$100 and through error his lawyer deposited another \$100, it was considered perfectly proper (under Roosevelt) to make out a refund voucher and return the excess payment. Nothing could be more logical and more reasonable, and yet I recall very distinctly that when the first case of this kind was examined by the local Forest Service law officer, we were told to our amazement that no authority in law could be found for such a refund.

You can imagine our embarrassment when we had to write a man who had deposited two hundred dollars in excess of what he owed that this could not be returned to him until it was authorized by law. It resulted in much criticism of the local service until a special law was passed (I think as a "rider" to the appropriation bill) authorizing such refunds. In public service, the legal way is the only satisfactory way. If the laws are at fault, try to have them changed.

Those in public service are often tempted to accept gifts or pre-requisites of one kind or another. Rather than cause offense, small gifts may with propriety be accepted, but the public officer should make it a point to return them in kind.

The old idea of a government "soft snap" is a thing of the past. Foresters in public service are exceptionally industrious. They must be sober. Immoral conduct or excesses that bring embarrassment or criticism on the Service are sure to be punished. Courtesy in dealing with the public and preservation of a gentle bearing under often trying conditions is essential to all good administrations.

Henry W. Jessup, of the Committee of Professional Ethics of the New York State Bar concluded in part:

"1. That, in any democracy, whether loosely organized or highly articulated, public servants must, in theory, be controlled by lofty standards of duty.

2. That the people are entitled to know what those standards are, and where there are none, to prescribe them.

3. That conformity to those standards must be enforceable in a proper tribunal.

4. That it is the highest interest of the profession itself that every case of violation of its ethical standards be investigated and all offenders dealt with 'less the res publica suffer.'"

In considering the ethics of those in private employ, we must look from a slightly different angle. In order to bring out certain concrete points, I have adopted parts of the codes of professional ethics of other professions that might govern the forester, but I wish to emphasize that probably the profession of forestry in the United States is as yet too young and too undeveloped to permit the drafting of a suitable code at this time. I shall suggest a solution later on.

The forester in private employ must (1) show fidelity to his clients. He is their faithful agent or trustee, and to my mind he must also be faithful to the ideal of reasonable forest practice as determined by local conditions. (2) The forester must receive a just and adequate compensation for his professional service in full understanding as to

the basis on which compensation will be computed. In fixing fees, it should never be forgotten that the profession is not a mere money trade. Overcharges in the case of rich clients should not be tolerated. There should be no competition by reducing charges, nor should the forester accept commissions or trade discounts or should he have an interest in a manufacturing company which sells to his clients. (3) The forester shall refrain from any efforts, directly or indirectly, to encroach upon the reputation, prospects, or business of another. (But see paragraph 7.) Ordinarily the work of another consulting forester should not be criticised or reviewed unless the client especially calls for this information. (4) The forester should refrain from associating himself with, or allowing the use of his name by an enterprise of questionable character. Not so many years ago a member of the Society of American Foresters was disciplined because he wrote an extravagant preface to a California Eucalyptus Booklet. Ten years ago there was unwise speculation in eucalyptus growing in California, which resulted first and last in a great many losses to private investors. (5) Controversy with clients concerning compensation should be avoided so far as shall be compatible with self-respect and the forester's right to receive reasonable compensation for his services. (6) The most worthy and effective advancement possible for a young forester is a well merited professional reputation. Solicitation of business to newspapers or agents and devices for self-praise are inadmissible. I understand, however, that it is the present practice in our profession to allow consulting foresters to advertise. (7) A forester should expose without fear or favor corrupt or dishonest conduct in the profession. It is often a distasteful task to expose the weakness of another in your own profession, but the men practicing law, for example, feel it is a part of their duty to expose a crooked lawyer and have him disbarred from the courts. (8) The forester is responsible to the public for a loyal and honest exercise of his profession. There is no question in my mind but that any technical discovery of value to the science of forestry should be made available to others as soon as practicable.

The other professions have deemed it wise to penalize the breaking of their codes by the expulsion from reputable engineering, legal and medical societies, but the names of those so disciplined (with some exceptions) are usually kept fairly confidential.

I have been asked "when is a forester not a forester." Rather than answer this question in detail, I will simply say that the forester

should be judged by his intent rather than by mere surface indications. I would rather call a forest school graduate a forester, even if he is working for a lumber company, which cannot practice forestry at this time, than the paid agent of an association, who spends his time lobbying against good forest laws on the ground that they are not practicable and will cost his association members money. The solution will be to judge each case on its merits, and in the final analysis the man under suspicion of breaking professional ethics should be given every opportunity to state his side of the case. There are men today in the Society of American Foresters who have no just claim to continued membership.

What I propose is this: Should not the Society of American Foresters appoint a small committee, to be called the Committee on Professional Conduct, with the understanding that the practicing foresters would refer questions of ethics to this committee for a decision, and that it should also consider formal charges preferred against members? In the course of the next decade such a committee, as a result of actual experience, could build up a code of professional ethics for foresters (based on cases) that would be a benefit to the profession.

HIGH SPOTS OF MODERN MANAGEMENT PLANS FOR THE NATIONAL FORESTS

BY JOHN F. PRESTON AND I. F. ELDREDGE

U. S. Forest Service

The problem of forest management in the United States is very different from the problem that confronts European foresters. No doubt, many decades ago, they had conditions comparable with ours of the present time. It is in modern times, however, that management work has been brought to such a high state of development by the Europeans. We American foresters have for many years been laboring under the handicap of trying to apply to our primitive conditions the lessons taught by modern European forestry. We thought that a plan of management worked out after a century or more of trial shots, for a few hundred or at the most a few thousand acres of forest land in Germany or France, should be applicable to a million-acre National Forest in America in its primitive condition. We are just beginning to learn that such a thing is impossible. There are still many reputable American foresters whose conception of a management plan seems to be based very largely upon the text book description of a modern European plan.

The hard earned experience of the last twenty years has at last brought us to see that while the principles of forest management may be the same the world over, the conditions peculiar to our country require something entirely different than a slavish following of European practice. We have behind us now a sufficient number of years of contact with our own problem to set out boldly to build up our management plans along the lines dictated by that experience, regardless of the fact that they may only faintly resemble the highly finished and often successful plans now in vogue in the older countries.

After many years of failure we have learned another lesson by bitter experience, and that is that a management plan can not arbitrarily be "wished" on a forest. A management plan possible to follow in practice can not be prepared until and unless there is an unmistakable demand for it. Until it is needed, a management plan is futile, footless, and a foolish waste of paper. Forest management is devel-

oped through the economic life of the people and goes hand in hand with its development. The rules, methods, and systems of forest management can be carried out only in so far as they are in accord with economic laws.

During the period from 1908 to 1912 the Forest Service made enthusiastic and strenuous efforts to prepare and put into effect a number of management plans, or, as they were then called, "silvicultural working plans." Experts were sent out to gather data and prepare plans for certain Forests. The plans when completed were usually most formidable documents, containing elaborate and detailed data, presented in many tables, graphs and diagrams, illustrated with many photographs, and often bound in large folios. As literary efforts these plans were monuments to their authors. The supervisors of the Forests concerned took these plans, looked them over, turned pale, and filed them reverently away. They are now to be found in storerooms covered with dust, and valuable only as lessons of the futility of making European plans for American forests not ready for them. Such plans were doomed to failure because they were premature and therefore did not fit and could not be carried out. They were theoretical in the extreme, and showed the influence of European forest literature in every sentence.

Following this period there came to practicing foresters the disappointing realization that the plans so enthusiastically prepared and adopted were only cold failures. The natural reaction in the Service, both in the field and in the various staffs, was an almost complete discrediting of the entire idea. There followed a number of years during which few, if any, attempts were made to formulate plans, although during this period conditions on many Forests were approaching the stage when the right kind of a plan could and should have been made.

As time went on the management plan idea commenced to appear a little in public, and spasmodic efforts at the preparation of systematic plans were made and more or less talking and preaching about them was done. Forest officers in charge of Forests began to feel the need for a taking of stock and of simple plans for handling what they had in order to give the best service to the dependent industries or communities and in some cases to forestall a future hiatus in the supply of forest products. Within the last four years the combined experience of Service men has led to a visualization of management

principles which expresses, to some extent at least, our commonly admitted American genius for practical adaption of means to an end. We now see in the mellow light of maturity the reasons for some of our early failures and make bold to believe that we have a grasp of the essentials of management plan work for American National Forests. The plans of our early days failed because of four main defects:

1. They were premature, in that in some cases no real management plan was needed or was feasible, and in other cases in that the plans were of a degree of intensity out of all proportion to the actual possibilities.

2. They attempted to cover too much ground. Almost invariably a whole Forest, regardless of its size, topography or multiplicity of conditions, was considered as a unit of management.

3. The plans more often than not were negative rather than positive in character. They imposed limitations instead of calling for direct action.

4. The plans usually ended "up in the air." That is to say, regardless of the brave start made and the formidable mass of data displayed, they usually finished without a decision as to where and when the allowed cut was to be harvested.

GENERAL PRINCIPLES.

We believe that the following paragraphs cover in a general way the principles that underlie management plan work of a kind fitted to our present conditions.

Practicability

The test of a successful management plan is its practicability. If the plan can not be put into effect it is a failure, no matter how brilliantly executed the management plan report and the work that preceded it may be. To insure its practicability the plan must not be made until the conditions call for a plan. A workable plan can not be made until the governing factors involved have reached a stage of development that will allow them to be clearly recognized and properly measured. When the demand for timber in a working circle nearly equals or exceeds what might be roughly calculated as the annual yield of the working circle, it is time to prepare a management plan. It is not always necessary to wait until the demand has actually

appeared. A plan might be made in advance of the demand, with the intention of at once developing the demand to take the estimated annual yield.¹

To insure practicability, it is necessary that discrimination be used as to who makes the plan. Since at this stage of development of American forest practice a management plan is based mainly upon the business end rather than the silvicultural phase, its successful execution will depend upon the clearness and accuracy with which the maker of the plan visualizes the prevailing economic conditions as well as the development of these conditions in the immediate future. It is comparatively easy to ascertain the stand of timber, its growth, and to calculate the annual yield, but it is a very difficult thing to prophesy with any confidence as to what may be expected in the way of development of markets, demand, utilization, transportation, labor supplies, increasing local population, etc.

The man who makes a plan for an area should know that area from every angle and should have a constructive imagination of the kind that made Jim Hill famous. Knowledge of the kind essential can not be acquired in a season or from a strip survey. To turn over the making of a management plan to an inexperienced forest assistant, however capable he may be, however much knowledge he may have of Hundeshagen, Hufnagel, and other famous masters of the craft, is almost a sure way to get an impractical plan. If he has some vision, has absorbed the forestry ideal, and knows the governing conditions, it is far better to trust the job to a hard-headed, cow-puncher supervisor than to an inexperienced forest school man. In other words, a workable management plan can not be made except by a man thoroughly acquainted not only with the statistics of stand, growth and yield, but with the economic conditions, difficulties and prospects, and with a good conception of what can be actually carried out.

Relation of the Timber Use Policy Statement to the Management Plan

Under the present procedure a statement of timber use policy is made for a Forest often some years in advance of the preparation of management plans for the working circles within the Forest. The relation of management plans to the timber use policy statement is perfectly clear if we get the conception that a plan is the instrument

¹ Systematic cutting plans are, of course, needed whenever the scale of operations permits a choice of cutting areas, but the authors are here talking about plans of regulation involving the determination and cutting of the sustained yield.

the application of which translates the policy into action. The policy statement should set out as clearly as may be just what the owner wants to achieve in the handling of his estate. The statement usually expresses the wishes of the owner under three main heads: Silvicultural policy, management policy, and sale policy.

Essentials of a Policy Statement

Under the first head is expressed the policy in regard to the handling of the stand in a purely silvicultural sense. There are settled such points, for instance, as whether the forest will be regenerated naturally or by planting; whether or not any attempt will be made to change the composition of the stand; the general attitude towards epidemic tree diseases or insect attacks, such as the chestnut blight or the blister rust. Under the second head are decided such matters as what forests or working circles are to be developed now and which are to be held for later exploitation; whether sustained yields or intermittent yields should be the object; whether quality or quantity of product should be the aim; and the proper place of grazing and recreational uses in a general scheme of management.

Under the third head, business objectives and policies are outlined in a general way. The kind of timber sale business desired, the degree of utilization to be insisted upon, and the markets to be catered to are all described, as well as such matters as terms of sale, minimum stumpage prices, sizes of sales wanted, policy as regards public relations with users of the forest, and such other matters as may be necessary to give the forester a clear picture of what is expected of him.

Management Plan

The management plan is a definite laying out of action to be taken. It is based upon certain specific conditions and must be limited to the area of forest on which these conditions exist. This area is a working circle. A management plan made for an area in which there is a great multiplicity of conditions must necessarily be so generalized as to amount to little more in the end than a statement of policy.

To be definite and at the same time practicable, the management plan must not cover too much of the future. The best prophets among us can see with any confidence but a little way into the future. Plans made to cover an entire rotation, setting out the areas to be cut in their sequence in the next hundred years are only ridiculous. The principles of the management to be followed and the policy of the

owner can and should be made so as to cover as long a time as possible, but the plan of action, that is to say, the management plan, can cover only a short period in the future.

Every plan must be subjected to frequent scrutiny and, when necessary, to modification. The plan is only valuable if it is alive and if it fits the circumstances. More often than not we can not control or change the circumstances, but we can always change the plan. During the first decade of its life a management plan may need changes so frequently as to arouse some skepticism as to its value; but this is a stage that must be gone through. As time goes on, conditions become more settled and foresters more experienced and more skilled in making future plans, so that ultimately on each Forest conditions will be stabilized to the degree where management plans can be followed for a considerable number of years without radical changes.

Scope and Intensity

A management plan should not attempt to outline the work to be done with too much detail. While it must be definite and positive, it should only hit the high spots and should leave to the local manager just as much opportunity for the exercise of initiative, business judgment and commonsense as he needs. In other words, the plan should confine itself to the essentials, the doing of which is necessary to put the owner's policy into action.

The scope of a management plan and the intensity of its prescription is in direct proportion to the value of the stumpage involved, the demand and the intensity of utilization. In some of the eastern Forests the demand is much greater than the supply on hand, the stumpage values are high, and the market uses practically all species and forms of material. The danger of an overcut is great and ever present, and the damage resulting from an overcut, both on local population and upon the silvicultural welfare of the forest, is too great with which to take chances. Here a management plan of considerable intensity is justified. Such conditions are rarely to be found in the western National Forests and less intensive management plans are usually required.

Data Needed

Most foresters, still remembering their text books, have an idea that a management plan can not be made without a great mass of scientifically gathered and mathematically accurate data. Experience has taught us that a satisfactory management plan for the primitive

conditions that prevail, even where management plans are fully justified, can be made with very little more data at hand than is now in the files of almost every supervisor in the Service. Detailed stand tables, accurate yield tables, growth figures, site classifications, are nice things to have and they have a certain satisfying look on paper, but they are unessential in nine out of ten of the rough-hewed management plans that we will work under during the next ten years at least. By the same token, a contour map is a pure luxury. Such a map appeals to every eye, of course, and is undoubtedly of value in the general administration of the area, but only by a stretch of the imagination can it be called essential.

Form of the Plan

A management plan is to a forester what a battle plan is to a troop commander. It should be simple, direct, positive and free of all unnecessary encumbrances. There is no place in a management plan for fine writing, long discussions, diagrams or graphs. These things can be put into the appendix. The plan should start off with a recital of the governing factors, that is to say, the premises on which the plan is based. Swiftly on the heels of this recital should be expressed in unmistakable terms, first, the silvicultural policy to be followed, that is, the manner of cutting. This is usually covered by a reference to the marking rules. Second, the management policy. Here is given the period over which the mature crop will be spread and the effect upon the rate of cutting and its allocation to areas and periods, of such factors as over-maturity, exigencies of practical logging, and local general economic conditions. Third, the timber sale policy, which provides for the size and kind of sales, special provisions in contracts, treatment of existing industries, etc., etc. The plan ends like a scorpion, with a sting in its tail. The last item is the culmination of all that goes before. It is the cutting budget. Here are definitely designated certain areas to be cut during the first period. This period may range from five to twenty years. The cutting budget is a definite decision on the part of all concerned which commits the owners to a certain line of action, and as long as the premises upon which the decision was based remain unchanged, the action is to be carried out.

Maps

The base map needed in most cases is one showing the boundaries of the working circle, roads, streams, etc., with sufficient topography

indicated (not necessarily by contours), to delineate and justify the parcels into which the working circle is divided. The number of separate maps showing age or size classes, productive land, forest types, ownership, and areas selected for the first cutting budget will be in proportion to the intensity of the plan and the complexity of the factors involved.

Carrying Out the Plan

The management plan report is only a means to an end. The execution of the plan is management and that is what we are after. Assuming that the plan was prepared by an experienced supervisor on the basis of reasonably good data and at a stage of development in his Forest where factors could be correctly judged, and assuming that the proposed plan has received careful study from the wise heads in the District office and in the Forester's office and has been approved—the real job yet remains to be done.

The essence of the management plan is the cutting budget. The Forest supervisor is the man upon whom falls the duty and the responsibility of putting its prescriptions into effect. Sooner or later on timbered Forests the carrying out of management plans will become the chief activity of the Forest organization and all other activities will be coordinated with it or subordinated to it.

To translate the management plan into action will require of the supervisor a high degree of initiative, ingenuity, and salesmanship. He cannot be successful if he considers himself merely the custodian of a natural resource. He cannot follow the passive policy of sitting in his office and waiting for nibbles from the buying public. He will have to set about aggressively finding a market for the parcels of timber covered in his budget, and, to do so, he will have to go out after the trade just as does any other merchant with a commodity to sell.

While the supervisor has the direct responsibility for the execution of the plan, he cannot do it alone. It will take the coordinated action of the whole organization, both below and above him. He cannot expect the enthusiastic assistance of his force or the firm backing of his superiors unless the plan has been "sold" to all concerned. In many cases the successful execution of the plan will require a degree of control of the situation that we now look upon as difficult if not impossible of attainment, but we know that eventually we must account for the resources put in our charge and that lack of the exercise of the

full authority given us by law will not be accepted as an excuse for failure.

A follow-up system is an essential part in the carrying out of a management plan. Once a plan is made for a working circle, management inspection thereafter is based upon that plan. The inspector compares promise with performance. He checks up in the field how well the supervisor has carried out the prescriptions of the plan in the various phases of silvicultural policy, management policy, timber sale policy, and cutting budget. He studies the working circle to see whether the practical working out of the cutting budget is approaching the objectives of management. Since the supervisor has the responsibility for recommending changes in the plan if the plan develops faults, the inspector will ascertain whether or not the plan is still in harmony with existing conditions.

If the supervisor has failed to approach a reasonable execution of the plan, then either one of two things needs to be done—either change the plan so that it can be carried out, or change the supervisor so that it will be carried out. It is not to be expected that a management plan made now, even under the most favorable circumstances, can be carried out with ease or with certainty. Conditions are changing so rapidly in the West that it will be difficult for many years to anticipate economic development with sufficient accuracy to make long-time plans or to make plans of any kind that do not need frequent modifications and revision. It is no easy job, but it is work that must be done if we are to carry out successfully the work entrusted to our care. It is after all the chief function of the Forest Service.

DO THINNINGS ACTUALLY INCREASE GROWTH PER ACRE AS COMPARED TO UNTHINNED STANDS?¹

By T. T. LI

It is a well established fact that by the use of thinnings the amount of material which can be secured on a given area of land in growing a forest crop is increased. As to the cause of this increase, two explanations appear possible. First, the increase may be due to the utilization in the thinned stand of material which dies and is lost in the unthinned stand. A number of trees, in the struggle for existence, die every year in the unthinned stand, and due to lack of utilization their volume is a complete loss which tends to offset partially or wholly the growth in volume of the remaining trees. It is quite evident that the saving of this class of material through thinnings will increase the amount of material that can be obtained during the rotation. Second, there may be an actual stimulation of growth in the thinned stand resulting in a greater production than in the unthinned stand entirely distinct from the gain due to utilizing material which will be lost through death.

Both of these explanations have a sound basis. While both causes of increased production may be operating the usual presentations of data showing the results of thinning combine the effects of the two in one total and fail to show the relative importance of each cause. This article is presented with the purpose of showing that for white pine (*Pinus strobus*) both causes are operating and to indicate the relative importance of each.

In attacking the problem, Bulletin No. 7 of the Yale School of Forestry, entitled "A Progress Report of the Results Secured in Treating Pure White Pine Stands on Experimental Plats at Keene, New Hampshire," has been used as a reference. This bulletin is a report on a thinning experiment in a pure white pine stand located near Keene. The experiment covers a period of more than 15 years. Table 1 has been computed from the data in this bulletin.

From the data in Table 1 for different plots the difference between the volume of the living trees at the beginning of the period after thinning and the volume at the end of the period before thinning for each

¹ Contribution No. 21, Yale School of Forestry.

TABLE 1

Plot No.	Treatment	Volume per acre in cubic feet								Increase between 1905-1920	
		1905		1909	1915		1920		Removed in thinnings 1905, 1915, and 1920		
		Before thinning	After thinning	Before thinning	After thinning	Before thinning	After thinning present stand Oct. 1, 1920				
601	"C" grade thinning	3,733.0	2,708.4	3,241.8	4,036.0	2,585.8	3,211.4	2,933.4	2,752.8	5,686.2	1,953.2
602	"B" grade thinning	3,708.0	2,756.4	3,264.0	4,076.4	3,232.0	3,872.0	3,669.0	1,997.2	5,666.6	1,958.6
604	No thinning, check plot	3,805.6	3,805.6	4,387.6	4,743.2	4,743.2	5,016.4	5,016.4	5,016.4	1,210.8

TABLE 2

Plot No.	1906-1909, 4 years				1910-1915, 6 years				1916-1920, 5 years			
	Net growth	Loss through death	Gross growth		Net growth	Loss through death	Gross growth		Net growth	Loss through death	Gross growth	
	<i>Cubic feet per acre</i>											
601	533.4	2.8	536.2		794.2	45.6	839.8		626.6	626.6	
602	507.6	40.4	548.0		812.4	38.8	851.2		639.2	639.2	
604	582.0	43.6	625.6		355.6	250.4	606.0		273.2	217.2	490.4	

of the plots was obtained. This is termed the net growth and represents the increase in volume less the decrease due to death from natural causes during the period. The amount of this decrease was found by taking from the original tally sheets of different plots the volume of trees which died within the period. The columns headed "loss through death" in Table 2 show these figures. The sum of the two items "net growth" and "loss through death" gives what is termed the "gross growth of the stand," or the amount of new wood actually laid on in the period.

It will be seen that in the first two periods after the experiment was initiated there was some loss through death in the thinned plots, due to too light thinnings, as well as in the unthinned plot No. 604. The net and gross growth columns show remarkable increases for the thinned plots over the check plot, except in the first period, where the highest values are in the check plot. This may be explained by the fact that the stands had been opened up for the first time and have not adjusted themselves in such a manner to respond to the new favorable conditions for growth. For the purpose of this article the first period will be disregarded.

In Table 3 the increase in net growth of the thinned plots over the unthinned plot is shown in percentage, using the net growth of the unthinned as the basis.

TABLE 3

Plot No.	Net growth in per cent of the unthinned plot taken as 100		
	Treatment	1910 to 1915	1916 to 1920
604	Unthinned	100	100
601	Thinned	223	229
602	Thinned	228	234

To separate the increase in growth into the two component causes: namely, (a) utilization of material dying in the struggle for existence, and (b) accelerated production in thinned stands, the amount of "loss through death" on the unthinned plot was subtracted from the amount of the increased "net growth" on each of the thinned plots and the remainder taken as the sum due to accelerated production in thinned stands. In the period 1910 to 1915 proper allowance was made for the loss through death in the thinned plots.

TABLE 4

Plot No.	Total increased net growth divided into its two component parts and expressed as percentages			
	1910 to 1915		1916 to 1920	
	Increase due to utilization of material lost by death in unthinned stand	Accelerated production in thinned stands	Increase due to utilization of material lost by death in unthinned stand	Accelerated production in thinned stands
	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>	<i>Per cent</i>
601	47	53	56	44
602	43	57	57	43

The conclusions drawn are that these thinnings in white pine stands resulted in: (1) net periodic growth approximately 123 to 134 per cent greater than the growth in the check plot, (2) of this increased net growth 43 to 57 per cent is attributable to utilization of material lost by death in the unthinned stand and 42 to 57 per cent to accelerated production in the thinned stand.

LIGHT BURNING

REPORT OF THE CALIFORNIA FORESTRY COMMITTEE

BY DONALD BRUCE

Division of Forestry, University of California

The following report, in most particulars self-explanatory, was unanimously adopted by the California Forestry Committee at its January meeting. This committee is composed the following members: P. G. Redington, District Forester, representing the U. S. Forest Service; M. B. Pratt, State Forester, representing the State Department of Forestry; R. F. Danaher, Manager of the Michigan-California Lumber Company, representing the California White and Sugar Pine Manufacturers' Association; C. R. Johnson, President of the Union Lumber Company, representing the California Redwood Manufacturers Association; B. A. McAllaster, Land Commissioner, representing the Southern Pacific Railway Company; Donald Bruce, Professor of Forest Engineering, representing the Division of Forestry of the University of California. The committee was organized in 1920 to study the question of light burning. This question, which has been the basis for a dispute lasting many years, was being heatedly discussed at that time, the light burning theory being supported by powerful and influential interests. Not only was cooperative fire protection between the Forest Service and lumbermen endangered, but the controversy threatened ill feeling along more general lines. The matter was brought to a head by three meetings of the California Section of the Society of American Foresters. The first of these was private and disclosed a wide divergence of opinion among Society members, not so much on questions of fact as on the adequacy of existing information and on the most advisable policy to be pursued. The two later meetings were open, with lumbermen and others interested in the forests specifically invited. At the first S. B. Show presented the views of the Forest Service, while at the second the arguments of the "light burners" were stated by Stewart Edward White, the well-known author, who also was a timber owner on a large scale. These meetings accomplished little directly save expose the actual and potential danger of the existing controversial situation, but it was

largely as a result thereof that the California Forestry Committee was organized.

This committee is unusual in the simplicity of its organization and in its complete lack of clearly defined functions and responsibilities. It came into existence to meet a specific need, it meets only when occasion arises and were its usefulness to cease it would die without the formality of disbanding. It is responsible to no one and has no authority. Its findings have weight only because of the nature of its membership and because it can act only by unanimous vote. All these peculiarities, which might seem weaknesses, have proved great sources of strength and vitality.

Its work and findings on the original issue are sufficiently described in the report itself. It may be of interest to add, however, that at a later date it was given a quasi-official standing through an action of the California State Board of Forestry. The board requested the committee to enlarge its personnel by adding a representative of the redwood lumbermen (the redwood region not having been involved in the light burning dispute) and to hold itself ready to act in an advisory capacity on matters of forest policy involving possible controversy. It has accordingly passed on numerous proposed legislative measures and has undertaken an investigation of the relative costs and advantages of "high lead" and "ground lead" yarding. According to many foresters the modern type of "high lead" yarding, claimed by the lumbermen to be decidedly cheaper, so completely destroys all seed trees and reproduction as to make subsequent fire protection the locking of an empty stable's door. The work of the committee on this question is barely commenced.

The theory of "light burning" is based on three postulates: (1) That under favorable circumstances fire will run through the forest, consuming dead needles and branches, but with little or no damage to living trees; (2) that the intensity of a given fire depends largely on the amount of inflammable debris which has accumulated on the ground since the preceding fire on the same area; (3) that complete prevention of fire is impracticable. If these three statements are true it seems to follow that numerous light fires, particularly if they occur at chosen favorable times, will do less damage than will the occasional but inevitable fire under a system of fire prevention which will probably occur at the worst possible moment and which, fed by

an accumulation of inflammable debris, will very probably become an unquenchable conflagration.

Opponents of the theory reply: (1) that even light fires always do some damage both to mature timber and more especially to reproduction; (2) that on the one hand the accumulation of true "debris" under a system of fire prevention ceases after five or six years, being from then on offset by decay, while on the other hand the accumulation of inflammable reproduction is an essential to timber production; (3) that reasonably complete protection has been proven practicable by the experience of the United States Forest Service.

A lively discussion along these lines, which at times became quite controversial in its nature and which was prejudicing any harmonious action looking toward the betterment of forest conditions in this State, resulted in the formation of the California Forestry Committee. Its original purpose was to investigate amicably the merits of the aforementioned theory.

It would seem that the investigation of the three simple postulates above-stated would involve few difficulties, since each is demonstrably either true or false. As a matter of fact, however, the work of the committee could not be thus simplified. The issue was a practical one which involved not so much the truth or fallacy of a theory as a practical and economical application of whatever truth there might be therein. The concrete problem, therefore, was not the correctness of certain theories but rather a determination of whether any modification in the existing system of fire protection could profitably be developed therefrom.

From its inception the committee found that the light-burning theory when translated into a concrete program of work was not a simple nor a single idea. Each of its adherents advocated a fairly definite procedure, but these procedures were diverse on such practical matters as the season of the year which should be selected for burning, and the like. While the existing system of the U. S. Forest Service was definite, standardized and well understood, the light-burning plans seemed to have in common only their opposition thereto and their reliance on the three postulates already stated.

It is true that the Indians are often referred to as the originators of light burning and this so-called "forestry" of theirs is regarded by some with an admiration which their agriculture and stock-raising methods (both equally suited to their simple needs) has failed to inspire. The fact remains, however, that no definite and complete

information is available, either as to what they did or as to its results, and that economic conditions have since too radically altered to permit our adopting their methods with impunity.

During the first year of its activities the committee restricted its efforts to a critical analysis of existing evidence and to an observation of the efforts of a number of timberland owners to put the untried theory into practice. Without going into details, in each case observed valuable information was obtained as to how not to light burn, but in no instance was a practicable plan encountered.

The second year was spent in an attempt to apply the lessons of the first year on a large scale experiment on Moffatt Creek, a few miles south of Yreka. After considerable effort the consent of the land-owners involved, all of whom favored light burning, was obtained and several weeks during the late spring were spent in trying to find conditions neither too dry to be dangerous nor too wet to make the expense of the operation prohibitive. Such a condition was not found, and only a small area was burned. On this the results were unsatisfactory.

The third year further work was done on the same drainage, but with a more limited objective. Specific information was sought on three points: (1) On the relative desirability of controlled fires burning down hill and up hill; (2) on the effect of a second burn on land already burned off two or three years before; (3) on the effect of burning on reproduction during the fall after growth had stopped.

Work was done on several tracts, the general method of procedure being, first, to make a detailed examination, cruise, and record of each; second, to burn it over; and, third, to re-examine it to determine the results. The spring work was unsatisfactory in that although conditions were so damp that fire would only run on the drier slopes, there was material damage done to both mature timber and more particularly to reproduction. In the fall the most dangerous portion of the fire season was abruptly terminated by heavy rains, after which the debris never again became dry enough to burn.

The conclusions of this and previous seasons are as follows: (1) Spring burning is dangerous because by the time the litter is sufficiently dry to burn satisfactorily the season is normally far advanced. No more rains can be counted on and smoldering logs and snags may hold fire well on into the fire season. (2) Summer burning can be kept under control, but apparently only at an expense out of proportion to the benefits obtained. (3) Fall burning is often impracticable,

because while vegetation dries out slowly it may become saturated with water in a few hours. Not infrequently the most critical period of the fire season is terminated by heavy rains, after which the ground never again becomes dry enough for burning. This condition may not be universal, but it seems sufficiently frequent to make fall burning impracticable as a generally applicable plan. (4) At any season the cost of light burning appears considerably greater than the benefits resulting. (5) Down-hill burning is decidedly preferable to up-hill burning, but it seems impracticable to avoid some up-hill burning on large experiments and even down-hill fires are not free from damage. (6) No burn yet observed failed to damage seriously reproduction. This statement includes down-hill fires and second fires on lands burned off previously within two years. (7) No burn yet studied critically failed to cause damage to mature timber which was considerably larger than would be apparent to a casual observer. (8) Under conditions where light burning is at all practicable it is unnecessary, since under such conditions protection by the ordinary methods is easy and far less expensive. (9) Under conditions where light burning seems most necessary it is too dangerous to be practicable. (10) Light burning on large areas at one time is impossible because the moisture conditions on slopes of different directions vary widely.

After three years of work the committee has not been able to find or to devise a fire protective system based upon the light-burning theory which seems more practicable and economical than that already in effect on the National Forests. At a meeting held January 5, 1923, it was therefore unanimously voted to discontinue this experiment.

Berkeley, January 5, 1923.

A BRIEF SUMMARY OF THE BUDWORM INVESTIGATIONS IN CANADA¹

BY F. C. CRAIGHEAD

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During the past twelve years a series of budworm epidemics have devastated the spruce and balsam forests of Quebec, Ontario, New Brunswick, and Maine. These epidemics originated independently between 1909 and 1918 and spread over enormous territories in a remarkably short time. The resulting losses are difficult to estimate but it is conservative to place the dead balsam in Quebec and New Brunswick at about 70 per cent of the commercial stand and spruce south of the St. Lawrence river at 40 to 50 per cent of the commercial stand. North of the St. Lawrence river no spruce was killed, but about five years' increment was lost due to retardation of the annual rings. Heart-rots have greatly aggravated the total losses in preventing the salvage of the dead trees.

Briefly an outbreak can be described by the history of the balsam sample plots at Lake Opasatika, Quebec. The first feeding began in 1918, continuing through 1921. In 1920 the caterpillars were most abundant and 60 per cent of the old foliage was removed. All the new growth was consumed for three years including 1921. Practically no caterpillars were present in 1922. Nine per cent of the stand (by volume) died in the summer of 1920, 12 per cent the following winter, and gradually increasing each summer and winter reached 20 per cent last summer. A total of 70 per cent is now dead which will increase to 90 per cent in the next three years. The outbreak in the red spruce forests follows much the same history except that spruce does not begin to die until some 5 to 6 years after the first feeding. This is due to the less serious defoliation of spruce as only the current year's growth is destroyed for a period of three to four years.

The death of the trees may be briefly described as due to failure of physiological functions following defoliation. Destruction of the

¹ Read at the annual meeting of the Society, at Boston, December 29, 1922.

leaves prohibiting the manufacture of the normal amount of food is immediately reflected in the reduction of the current annual ring and the death of the absorbing rootlets. Many trees die at this stage following complete defoliation. After the second or third year many trees fail to form any wood on the lower trunk which further restricts transportation of water. The older needles dry and fall and finally the entire tree dies. There is a direct ratio between the death of the trees and the amount of the defoliation. All trees receiving 75 and 100 per cent defoliation died one or two years later. No trees have died receiving less than 25 per cent defoliation. The effects of low temperatures during the winter and the amount of available moisture are also important factors. Fungi, bark-beetles, and borers are of little significance² except in the case of *Monochamus marmorator* attacking weakened balsam for some five years after the feeding stops.

Trees recovering from the outbreak show marked retardation of the annual rings in a very characteristic manner. The annual ring laid on during the first year of feeding is sharply reduced in the terminal part of the stem, decreasing in intensity toward the middle to a point where it is not noticeable, followed by a gradual increase further down which becomes quite marked at the base. The later rings in the terminal portion of the stem show slight recovery the second or third year then greatest reduction before final recovery. The narrowest ring is formed the same year in the top, middle and basal portions; in balsam five years, in spruce four years after the first feeding. In no cases in those trees which recover from the outbreak were any rings entirely lacking but in many balsams one to three years are often represented on the basal half of the stem by only small sectors of wood.

Loss of summerwood is a very characteristic feature of the feeding. Frequently no summerwood is formed in the terminal the first year of feeding, while at the base, summerwood fails to form during the second or third years depending on the degree of defoliation. Other morphological defects are characteristic of the wood laid on during the feeding period.

One of the most striking features of the budworm epidemic is the great variability of the resulting deadening in different locations. This is largely due to the distribution of forest types and the vigor of the stand. The controlling factors are percentages of balsam or hard-

² Based on consecutive observations of some 400 numbered trees on experimental plots.

woods. The effects of the feeding have been studied in two forest regions, the Laurentian region, north of the St. Lawrence River, and the Acadian region, south of the St. Lawrence River. The chief difference in these regions is in the occurrence of red spruce in the Acadian while only black and white occur in the Laurentian. The types studied are as follows:

1. (Black) Spruce, Swamp Type. Laurentian region.
2. (Black) Spruce, Slope Type. Laurentian and Acadian regions.
3. White Spruce Stands. Laurentian and Acadian regions.
4. Northern Hardwood Type. Laurentian and Acadian regions.
5. Birch and Poplar Types. Laurentian region
6. Birch and Poplar Types. Acadian region
7. (Black) Spruce, Flat Type. Laurentian region.
8. (Red) Spruce, Flat Type. Acadian region.
9. Fir, Flat Type. Laurentian and Acadian regions.
10. Fir, Slope Type. Laurentian and Acadian regions.

Other factors being equal the degree of injury roughly corresponds to the order of enumeration. Types 1, 2, 3, and 4 and younger stands of 5 and 6 can be considered budworm-proof for all practical purposes; also black spruce in the Laurentian region in any type, and red spruce when in pure stands of large extent or in second growth hardwood mixtures up to 50 to 70 years.

The degree of defoliation of the spruces and balsam is chiefly due to the variation in development of the new growth; to the migratory habits of the larvae, and to the fact that the old foliage of spruce is not consumed by the larvae. Black spruce was not killed in any type. Its immunity is due to the extremely slow development of the new growth not supplying sufficient food to mature the caterpillars. Red spruce is destroyed in all types due to the rapid development and prolificness of the new growth; however, it is least affected in pure stands of sufficient extent to be isolated from balsam. The greatest mortality in red spruce occurs in balsam mixtures. White spruce is rarely killed due to the fact that the early hardening of the new growth, causes migration of the larvae, thus preventing heavy stripping. The more rapid the growth of the tree and the greater the available moisture supply the better the stand recovers from the effect of feeding. Balsam is the controlling factor in the intensity of the outbreak and severity of feeding. Hardwoods offer an effective protection due to

the unfavorable aspects for ovipositing of the moths and the more scattered distribution of the conifers. The caterpillars migrate as soon as the new growth is consumed thus when the conifers are more dispersed large numbers of larvae fall to the ground and die.

Past lumbering operations by diameter limit and preference for spruce have greatly increased the percentage of balsam, producing conditions which have made possible the present epidemic. We may expect local outbreaks of varying intensity at any time, after a certain percentage of balsam becomes dominant in the stands. Budworm outbreaks have considerable effect on the resulting composition of a forest, tending to increase the percentage of spruce under certain conditions in spruce flats, and quite likely have played an important part in the development of pure spruce stands in the past.

Prevention of future epidemics is purely a question of forest management, whereby types are developed that are least favorable to the enormous multiplication of the insects and least susceptible to injury. Fortunately such conditions are in accord with all ethics of good forest management.

Briefly the suggestions in this respect are as follows:

Diversified forest types to break up large continuous canopies of balsam.

Utilization of hardwoods, both tolerant and intolerant, to encourage growth of mixed softwood-hardwood types.

Short rotations of all balsam mixtures and pure red spruce in the vicinity of balsam.

In conclusion, I would like to make a few more general remarks. Investigations of the budworm have preceded far enough to shift the responsibility for future epidemics on those managing the forest. There is no quick and easy "cure all." Briefly this whole situation can be expressed in a few words of Mr. Zon's: "We now know that only a forest growth which is perfectly suited to the physical conditions of the situation proves resistant to all natural dangers that may threaten it, no matter whether it is pure or mixed. A forest type possessing the most valuable quality—stability—is, therefore, the ideal to which a forester must strive in regenerating and caring for his forest."

Insect epidemics of native species are dependent on environmental conditions which are usually maladjustments of stable conditions

brought about by decadence of the stand or interference of outside agencies.

I do not believe that there is a single native forest insect pest that cannot be controlled by production of stable forest conditions. Our wonderful forests of the past are ample proof of the fact.

The study of these problems is only partly entomological, the solution lies in joint investigation by the forester, plant mycologist, plant physiologist and entomologist.

The various phases are so interrelated that a solution based on the entomological aspects alone is hopeless. Entomological investigations in the future must be much more detailed and much more experimental work is needed, considering both physiological and pathological conditions of the tree and each particular species of insect. Without the cooperation of the foresters in the application of the investigations to the practise of forestry the problems are only half solved. Forest entomology is only one of the many fields, though an extremely important one, in the broader science of forestry.

CLASSIFICATION OF FOREST SITES¹

A committee was appointed under a resolution adopted at the annual meeting of the Society in New York, December 20, 1920, "to consider the various suggestions for site standardization with reference to their practicability for adoption by the profession."

The real intent of the mandate appears to have been the standardization of methods of classifying sites, rather than the standardization of the sites themselves, because that is entirely beyond the feeble powers of a small committee of humans. Though not expressed in the wording of the resolution, the context shows that the principal idea in the minds of its authors was the consideration, and possible adoption in some form, of the classification based on height growth of trees, or the suggestion of some better plan.

OBJECT OF SITE CLASSIFICATION

As a first step, it is necessary to decide just what we mean by "sites" and why we want to classify them. Reduced to the simplest terms, a forest site is a piece of forest land, using the term land in a broad sense to include the soil with its underlying rock and the layer of atmosphere superimposed upon it. Both soil and atmospheric conditions, occurring in an almost infinite variety of combinations from one locality to another, influence the kind or quantity of timber which the site can produce. Moreover, the productive power of a given site is susceptible of wide fluctuation, according to the kind of silvicultural treatment that is given it. The classification of sites, for our purposes, merely means to assign to each its capacity to produce wood or cubic feet of cellulose. We are not interested primarily in arranging all the forest lands of a region or of a whole country in a 1-2-3 order according to their productive capacity, but what we want is a method by which we may be enabled to designate for any and every specific piece of forest land the amount of timber which it can produce. In other words, an absolute classification is required, rather than a relative one.

¹ Report of committee appointed by President R. C. Bryant, 1921.

PRESENT PRACTICE

It has become customary to classify sites by dividing the entire productive range into three, five, or more zones, calling each zone a site quality (I, II, III, etc., usually beginning with the most productive), and assigning specific sites to one or another quality-class, on the basis of certain characteristics of the tree growth on the site or of the site itself. The yields for the specific site are then predicted on the basis of a standard yield table, generally with the use of a correction factor to allow for the variation of the particular site from the standard for its class.

FACTORS INVOLVED

The prediction of yield necessarily involves consideration of not only the amount of wood tissue (which should be expressed in solid cubic volume of wood in the forest rather than in board feet or any other unit which depends on methods of utilization), but also the kind of wood (as amounts will vary with species), and the time element. As the quantity of wood produced varies with the age of the stand for the same site, it is necessary to refer the figures of yield to some definite age or period in the life of the stand. Another factor which must be considered is the treatment of the stand. On the same site the yield will vary according to whether the stand is managed by the selection system, a clear cutting system, or some other, or whether it is managed at all.

It is clear that we can classify a given site differently according to any one of several species which may grow on it, or any combination of two or more of them; according to any age or stage of development that we may choose, and according to any method of handling. For purposes of simplicity, it seems best to (a) classify primarily according to the species or combinations of species which are now present, or which are under consideration for it, depending on the purposes of the particular classification; (b) consider only the probable mean annual yield at about the period when it culminates, rather than at a fixed age regardless of species; (c) consider the yield of approximately fully stocked but not overcrowded stands ("well-stocked" stands) under natural conditions, without any allowance for thinnings or other silvicultural treatment. To consider these points more in detail:

Species

(a) For purposes of timber survey, broad regional surveys of future yield probabilities, and the like, the classification should generally be in terms of the species now occupying the land or those considered likely to occupy it within the period under consideration. Thus much of the sand plain in the Lake States might be classed as jack pine land of a specified yield capacity. But where the classification is for the purpose of predicting what may be expected under management, or to decide between several species which may be grown on the site, the classification may be in terms of other species. The Lake States sand plain land might in such a case be classified in terms of its potential yield of Norway or white pine, or it might be classified in terms of each of the three pines, for the purpose of deciding which one to favor in management.

Age

(b) In order definitely to classify a site and to make use of yield tables, it is necessary to assign an approximate age for which the mean annual yield per acre is reckoned. This age will vary more or less according to species, and possibly even according to site quality itself. The most significant age to take appears to be that at which mean annual growth culminates. There are not sufficient data at hand yet to justify an attempt at fixing a standard age or ages for use in this connection. Many of the yield tables which are available indicate an age somewhere between 35 and 80 years, and also seem to indicate that no serious error will be involved if an age 10 or even 20 years before or after the culmination of mean annual growth is taken. This point suggests the possibility of selecting a very few standard ages to cover all species, and also that there is no need of splitting hairs in designating the basic ages. The tables indicate that the use of 50 years as a standard will be fairly accurate for most American species, except a few slower growing ones such as those of the Rocky Mountains, for which 80 years is better. For a few trees of rapid growth like the cottonwood, 25 years is more nearly correct.²

Treatment

(c) The classification should be on the basis of stands which can be found and made the basis for yield tables, rather than highly artificial

² The use of a standard age may perhaps be dispensed with altogether, and the actual age of culmination of mean annual growth used instead.

stands into whose yield the personal equation enters so largely. Using well-stocked natural unthinned stands of approximately even age as a basis, converting factors can be worked out to translate yields into terms of stands thinned according to various methods, and according to other methods of silvicultural treatment.

To summarize: The purpose of site classification being to express power to produce wood, the only valid basis of classification is the potential volume production of wood, of the species growing or to be grown on given sites. In order that this potential production may be expressed on a standard basis, it is necessary to assume a definite period in the life of the stand, preferably approximately the period of culmination of the mean annual growth, and a definite method of treatment, preferably well-stocked unthinned natural stands of approximately even age.

DESIGNATION OF SITES

No advantage appears to be gained by making a I-II-III series of standard average sites. Just as we would speak of 30-bushel or 10-bushel wheat land, rather than Quality I or Quality III wheat land, so should we say 100 cubic foot or 30 cubic foot white pine land. With such a system, the name gives directly the information desired, without being first translated. Moreover, this obviates the difficulty of comparing the sites in one region with those in another. Sixty cubic foot Douglas fir land means the same yield, whether it is in Oregon or Arizona, and it is not necessary to call it Site III in the one place and Site I in the other, nor yet Site III in both regions. Likewise, if a given piece of land will produce 50 cubic feet per acre per annum of jack pine and only 30 cubic feet of white pine, we do not have to say it is Site I for jack pine and Site III for white pine. We do not particularly care how it ranks as jack pine or white pine land, for what we are after is how much jack pine or white pine timber will grow on it. For practical use, standard site classes have little value. We might measure the timber cut from a tract by dividing the entire range of log sizes into three or five classes, and then scale the logs by tallying them as Size I, Size II, etc. The total would come out somewhere near right if thousands of logs were thus tallied, but we should know little about individual logs, and for small lots the error would be considerable. A better way, and the one commonly used, is to tally each

log according to what it actually scales. The same should be done with sites, instead of putting them into a limited number of classes.

NUMBER OF SITE QUALITIES

The number of sites used will vary with the individual manager, according to the aims and intensity of management and the diversity of conditions. In one place, all stands of a given species or type of forest may be thrown together into one quality class; in another place, there may be such a variety of conditions with wide range of soil qualities, or the management may be so intensive, that ten or a dozen qualities may be recognized. With intensive management, Hanzlik's site classes for Douglas fir in the Northwest, for instance, will not suffice, because a manager figuring on long-term investments yielding only five or six per cent or less can not figure closely enough where there is a gap between Site II and Site I of 34,000 board feet per acre, with Site I representing stands on the average 50 per cent heavier than those on Site II. Under intensive management it is likely that several intermediate sites between these will be needed. The redwood region affords another instance of forests where 3, 5 or even 7 "standard" site classes will not suffice for practical application.

SITE INDICATORS

The method of determining in the field what yield should be assigned to a given site—the indicator used to denote its yield capacity, is quite a different matter from naming the site itself. Various methods have been proposed, including (*a*) height growth of the main-stand (dominant and co-dominant) trees; (*b*) vegetative indicators—ground cover plants; (*c*) analyses of soil and climatic factors; (*d*) composition of the existing or original forest; (*e*) actual measurement of the volume growth; (*f*) form factors; (*g*) color and development of foliage. It makes no especial difference which method is used, so long as the right answer is obtained. —

The simplest and most convenient indicator to use in the majority of cases is probably height growth, since growth in height is readily measured, and for dominant trees in stands which have not grown too open or too crowded is a fairly good, even if not always accurate, indicator of the power of the site to produce wood. But on millions of acres, including non-restocking forest land and many acres of young

growth where older trees are lacking (for height growth is probably not a safe indicator in the juvenile period, say up to about 20 years for most species), some other method must be used. Analysis of the physical factors of soil and climate and comparison with similar sites whose productive capacity is known may sometime be as accurate a method as can be devised, but it is very slow and costly, at least in the light of our present knowledge of the relative effects of various factors on growth. Vegetative indicators, both the composition of the forest itself and of the subordinate vegetation, will often give a very good line on the productivity of the site, and may eventually prove fully as accurate as any, perhaps in combination with some readily noted physical factors. Our knowledge of the relations involved here is extremely limited as yet, and will be for many years, yet this method is about the only one we can use on vast areas where there is no height growth to measure.

DATA REQUIRED FOR USING HEIGHT GROWTH AS AN INDICATOR

To use the height growth as an indicator of potential yields, we need two sets of data: (a) Tables of total yield or mean annual yield, for various qualities, basing the qualities of site on average height at approximately the age when mean annual growth culminates; (b) Tables of height growth based on age, for the corresponding site qualities. These tables, which should be prepared by the use of curves (plotted on three dimensions), will have the following forms (A and B):

TABLE (A).

Age—years	Height 100 feet at 80 years	Height 90 feet at 80 years	Height 80 feet at 80 years	Height 70 feet at 80 years
	Mean annual growth—cubic feet per acre			
20	15	12	10	} etc.
30	25	20	16	
40	30	24	20	
50	35	28	23	
60	40	32	27	
70	45	36	30	
80	45	36	31	
90	42	33	29	
100	38	30	26	

This table can be made by constructing a few (three or four) curves of yield based on age, and interpolating to get the other curves. Instead of taking the highest one-third or one-fifth of the plots as a basis for a Site I curve, and the next highest one-third or one-fifth for the Site II curve, and so on, the plots whose average height at 80 years (or whatever other age may best correspond for the culmination of mean annual growth) is 100 feet (between 95 and 105 feet) are used to construct the curve for 100-foot sites, and so on. The yield curves actually constructed should be based on plots with a narrow range of average heights—preferably ten-foot classes, as illustrated; if only three or four are made, however, they should be widely enough distributed over the range of heights for the species or type so that yield curves for all other height classes may be made by interpolation. If heights at the age of culmination range from 50 to 160 feet, for instance, and only four yield curves are actually constructed from measurements, they should be taken for, say, 60-foot, 90-foot, 130-foot, and 160-foot stands. Then the values for 50, 70, 80, 100, 110, 120, 140, and 150 foot stands can be found by interpolation.

TABLE (B).

Age—years	Height at 80 years—feet						
	30	40	50	60	70	80	etc.
	Height at age given—feet						
20	8	10	12	} etc.	{ etc.	18	} etc.
30	10	13	16			28	
40	13	17	21			39	
50	17	22	27			50	
60	22	28	34			60	
70	26	34	42			70	
80	30	40	50			80	
90	33	45	57			88	
100	35	50	63			95	

This table may be constructed in much the same way as the table of yields, plotting a few curves from measurements and plotting the others by interpolation.

METHOD OF CLASSIFICATION BY HEIGHT-GROWTH

To use these data in predicting yields of specific sites on the ground, the average dominant height of the given stand will be measured and its age found. With these and Table (B) the stand can be allocated to the right site class. From Table (A) its potential yield can then be read directly, if its stocking is approximately normal, otherwise a correction factor can be used, based on the ratio of actual volume of the stand to that for the same age in the table. To illustrate: suppose we have a stand of a type to which the above tables apply, and find that it is 60 years old and 59 feet high. From Table (B) we see that it belongs in the 80 foot class. Looking under that class in Table (A), we find that a well-stocked typical stand should have a mean annual growth of 27 cubic feet per acre at 60 years, or a total stand of $27 \times 60 = 1,620$ cubic feet per year. We find that our stand has 1,460 cubic feet, or 10 per cent less. Applying a reduction factor of 10 per cent to the mean annual growth at 80 years, we get 28 cubic feet as the mean annual growth at the culmination period, and our stand is on 28-cubic-foot land for the particular species involved. Yet, although under the proposed standard classification it will be designated 28-cubic-foot land, it may yield less than that amount, as shown in the yield table, if managed on rotations less or greater than 80 years, and may also yield more or less, by certain amounts to be determined experimentally, according to variations in silvicultural treatment.

SUMMARY OF RECOMMENDATIONS

Your committee recommends:

1. The adoption of a standard *method* of classifying forest sites, on the basis of the actual mean annual growth in cubic volume at approximately the age of culmination of mean volume growth for typical well-stocked natural stands of the species present or to be grown on each site.
2. The construction of yield tables which can be used with such a method of classification, as suggested above, in place of the present system of dividing the total range of yields into 3 or 5 parts, with an average yield table for each group.

Your committee does not recommend the adoption of any one method

of determining site-quality, but is inclined to look with favor on the use of height-growth of dominants, in stands above the juvenile stage, if neither too open nor too crowded.

H. H. CHAPMAN,

R. T. FISHER,

C. D. HOWE,

DONALD BRUCE,

E. N. MUNNS,

W. N. SPARHAWK, *Chairman.*

NOTE.—The other member of the committee, Russell Watson, does not agree altogether with some of the suggestions made above, and may later present a separate report.

AN OUTLINE FOR THE CLASSIFICATION OF FORESTRY LITERATURE

FINAL REPORT OF THE SUB-COMMITTEE OF THE COMMITTEE ON FORESTRY EDUCATION

In July, 1919, President Olmsted appointed a Committee on the Classification of Forestry Literature consisting of J. W. Toumey, A. B. Recknagel, and C. F. Korstian. After due consideration this Committee concluded that a classification of the wide scope thus implied would hardly be useful in arranging a library of forestry literature, where the basis of classification is a special problem, determined more or less by the character of the books and pamphlets comprising the particular library. At any rate, the classification of the books and the bulk of the other material which comes to the library of a forest school, a department of forestry, or a forest experiment station must be handled by a somewhat different plan than a classification of literature pertaining solely to forestry. The Committee, therefore, began work upon two classifications, one for forestry literature in general and the other for a forestry library.

The decimal classification published in the JOURNAL OF FORESTRY in 1917¹ was accepted as the starting point for a general classification of forestry literature. The greatest usefulness of such a scheme would be in connection with filing or compiling unpublished notes and reports, clippings, small pamphlets, photographs, etc. The orderly disposition of such material has always been a thorn-in-the-flesh of forestry professors, forest administrators and forest investigators, whatever the specialized field involved. As the starting point in developing a library classification, that proposed by the School of Forestry of Yale University² was accepted. Both classifications were considerably modified and the latter added to as a result of criticisms and suggestions received by this Committee. In March, 1921, the work was merged with that of the Educational Committee and in May, 1921, the undersigned sub-committee was charged with the responsibilities of con-

¹ Korstian, C. F. A decimal classification for forestry literature. JOURNAL OF FORESTRY 15: 449-462. 1917.

² A classification for forestry literature; prepared by the faculty of the Yale Forest School. Yale Forest School Bul. 1. 6 pp. 1912.

tinuing the work on standardization in the classification of forestry literature.

About 300 letters were addressed to professional librarians and prominent foresters in the United States and Canada circulating revisions of both schemes and soliciting criticisms and suggestions. A surprisingly large number of replies were received indicating considerable interest in the problem of classification. Some of the replies were especially constructive and contained many valuable suggestions. The Committee regrets that it could not make use of all the constructive thought which the different critics submitted for its consideration but it had to be governed largely by the consensus of opinion, when logically presented.

After a careful review of all the replies, especially those from the professional librarians, the conclusion was reached that, inasmuch as there are in use at the present time a number of satisfactory and practicable schemes for classifying and cataloging library material—among which those of the Yale School of Forestry,³ the United States Department of Agriculture (Forest Service),⁴ and the Library of Congress⁵ may be mentioned, to say nothing of other plans which are followed by other institutions—the present Committee should devote its energies mainly to the working out of a logical general classification scheme, one which would be suitable for use either by specialists in a given branch of forestry or in the compilation of manuscript material, notes, clippings, photographs, reports, etc.

Almost every library is unique in that its problems of classification are more or less peculiar to the particular institution it is serving, be it forest school, university, department of forestry, forest experiment station, or other organization. Furthermore, practically every library, if it does not have a complete classification, has at any rate made a good beginning and to make a radical change would be very expensive.⁶

³ A very much extended and amplified revision of the scheme given in Yale Forest School Bulletin 1.

⁴ Scheme of Classification; Library of the U. S. Department of Agriculture. 51 pp. 1916.

⁵ Classification; Class S, Agriculture—Plant and Animal Industry; Library of Congress. 87 pp. 1911.

⁶ Miss Claribel R. Barnett, Librarian of the U. S. Department of Agriculture, is authority for the statement that it would undoubtedly be desirable for the library of this Department to adopt a new classification—one used more widely by other libraries—replacing the old one which was made in 1889, but this has never seemed feasible on account of the great amount of work and expense involved in the reclassification.

It is unquestionable that one or another of these library schemes will, with at most minor changes, satisfy the requirements of practically every forestry library, while the accompanying general scheme will afford the specialist the best basis for a classification which he can contract or expand at will and yet still remain oriented with reference to the other major branches of forestry. Even in the case of the general classification scheme it is evident that inter-relations and variant viewpoints render practically impossible the formulation of any one system which will be capable of application to all cases. The best we can do is to decide upon the most logical and workable scheme, admittedly not ideal, and then stick to it with just as few subsequent changes as possible. This point of view is even more imperative in the case of a library classification scheme.

Your Committee, therefore, does not recommend the accompanying scheme as a panacea for all classification ills but suggests it as a workable compilation scheme. The previously published scheme in modified form has been tried out successfully in at least four forest schools, three forest experiment stations, and two district offices of the U. S. Forest Service. Some institutions have worked out independently schemes of their own along similar lines which they report to be using successfully.

Others report that they have been using the published classification with slight modifications for circular literature, which is becoming an important item in the profession. One of our correspondents, a professor at one of the leading forestry colleges, states that by filing such material in ordinary vertical filing cabinets they find it one of the most useful parts of their library.

Your Committee believes that the greatest utility of the general classification scheme will lie in its use for compilation purposes, as an adjunct to a regular library and in the smaller institutions where clerical help or librarians are, perforce, at a premium. In the latter case the material can, if necessary, be filed by subjects in the compilation file without the use of a card index, while in larger libraries using the classified compilation file as an adjunct to the library proper, the segregation of the material in the file by subjects is still desirable even though it is cataloged in the regular alphabetic index.

Any classification or compilation scheme should render information more accessible. The object sought in the compilation of forestry

knowledge is to secure a direct reference to all material of permanent value to the profession pertaining to a given subject. A systematic plan of classification to be most useful should be simple and yet comprehensive, practical in application, capable of further expansion as the demands upon it increases, and sufficiently broad to cover all branches of forestry. Furthermore, any scheme of classification to be of permanent value must not merely be as comprehensive as present knowledge will permit and provide for all future contingencies which are at present only dimly discernible, but must also allow of expansion to take care of developments which cannot now be predicted at all.

It is doubtless true that few foresters will need the complete outline. The major divisions are expanded to an extent which it is believed will meet the needs of most specialists. It can therefore be made to serve the whole profession. One can select as few or as many of the topics as he wishes for his compilation file and still not destroy the logic or continuity of the general scheme. In covering the whole field of forestry the classifications under the various headings have been logically intensified; each classification being about what a specialist in that particular subject would make. For example, a silviculturist would probably use the greater part of the Forest Botany and Silviculture sections while he would condense Lumbering and Utilization very much.

The decimal system of classification has been preserved throughout. The entire subject of forestry was divided into nine component parts of approximately equal importance. All subdivisions were also necessarily limited to nine. This limitation, however, is no serious defect of the scheme, and it was largely off-set by choosing broad, comprehensive major captions and in some cases by further amplifying the secondary subjects. While practical utility and economy are the potent characteristics of the decimal system of classification, yet logic is important since those who will use the scheme must know at least the main branches, which are more easily remembered if they are few in number and logical in arrangement.

In the proposed scheme not all subdivisions have been equally expanded. This depends somewhat on the development of the subject and partly on the demand; "Climatic injuries," for example, have been subdivided more than "diseases" and "insects." Considerable latitude has still been left for expansion or contraction. The numbers to the left of the decimals have been omitted for all except the major headings. It is believed that this simplification will facilitate the use of the scheme

and still permit sufficient latitude to adapt it to the Dewey Decimal System by those who wish to do so. The methods of using a general scheme of this kind for compilation purposes have been detailed by Korstian⁷ so that it seems unnecessary to repeat them here.

The Committee desires to express its appreciation of the kindly interest shown in this project by the many librarians and foresters who have offered valuable criticisms and suggestions. The Committee is under particular obligation to Dr. C. D. Howe, Dean of the Faculty of Forestry, University of Toronto, and Mr. C. L. Forsling, In Charge of the Great Basin Grazing Experiment Station, who supplied what the Committee believes to be the best classifications offered for Forest Ecology and Grazing, respectively. These with minor modifications have been incorporated in the proposed scheme. The general classification scheme recommended for compilation purposes follows.

C. F. KORSTIAN, *Chairman*;

A. B. RECKNAGEL,

JOHN M. BRISCOE.

GENERAL CLASSIFICATION OF FORESTRY LITERATURE.

- 0.0^{*} *General Forestry.* (Material covering entire subject or several branches not classified elsewhere.)
 - .1 Bibliographies.
 - .2 Manuals of forestry, general treatises, essays, addresses, etc.
 - .3 Dictionaries, encyclopedias, yearbooks, almanacs, calendars, etc.
 - .4 Biographies.
 - .5 Forestry periodicals, lumber and trade journals.
 - .6 Proceedings and reports of societies, associations, commissions, conventions, federal, state, provincial and municipal forest officers, etc.
 - .7 Forest experiment stations.
 - .8 Forest education (See also 8.713 and 8.724).
 - .81 Forest schools.
 - .82 Arbor day.
 - .83 Nature study and general propaganda.
 - .9 History and status of forestry (See also 8.7).
 - .91 United States (alphabetically by states).
 - .92 Canada (alphabetically by provinces).
 - .93 Foreign countries (alphabetically by countries).
- 1.0 *Forest Botany.*
 - .1 Dendrology.
 - .11 Anatomy and morphology (including cytology and histology).
 - .12 Physiology.
 - .13 Taxonomy.

⁷ Ibid.

- 1.0 *Forest Botany (Continued).*
 .2 Forest ecology.
 .21 Biological dendrology (Reaction of individual trees to environmental factors).
 .211 Site factors.
 .2111 Light.
 .2112 Temperature.
 .2113 Precipitation.
 .2114 Humidity.
 .2115 Soils—general.
 .21151 Soil physics.
 .21152 Soil chemistry.
 .21153 Soil biology.
 .211531 Bacteria.
 .211532 Mycorrhiza.
 .2116 Water relations (Transpiration in relation to humidity, soil, water and temperature).
 .2117 Measurement of site factors.
 .212 Seed production.
 .213 Germination.
 .214 Growth.
 .2141 Habitus (Tree forms).
 .2142 Sprouting capacity.
 .2143 Root development.
 .215 Acclimatization and adaptation.
 .216 Phenology.
 .217 Distribution (Geographical).
 .218 Silvical characteristics (General descriptions alphabetically by species).
 .22 Silvics (The reaction of tree aggregates to environmental factors).
 .221 Forest geography and forest descriptions (alphabetically by states, provinces, regions or forest types).
 .2211 Climate as influencing vegetation forms.
 .222 Forest types and site qualities.
 .2221 Basis of classification.
 .2222 Origin and development (Migration, invasion and establishment).
 .2223 Succession.
 .2224 Alternation and zonation.
 .2225 Methods of study and mapping.
 .3 Regional floras and plant description.
 .4 Accessory forest vegetation.
 .41 Cryptogams.
 .42 Phanerogams.
- 2.0 *Silviculture.*
 .1 Silvicultural systems of natural reproduction.
 .11 Clearcutting.
 .111 Strips.
 .112 Groups.
 .12 Seed tree method.
 .13 Selection method.
 .14 Shelterwood.
 .15 Coppice.
 .16 Coppice with standards.
 .2 Intermediate cuttings.
 .21 Improvement cuttings.

2.0	<i>Silviculture (Continued).</i>
.22	Cleanings.
.221	Cleanings by animals.
.23	Liberation cuttings.
.24	Thinnings.
.25	Salvage cuttings.
.26	Pruning.
.3	Marking.
.4	Brush disposal.
.41	Piling.
.42	Top lopping and scattering.
.43	Burning.
.5	Forestation.
.51	Seed.
.511	Seed production and source.
.512	Collection.
.513	Extracting and cleaning.
.514	Testing.
.515	Storage.
.516	Treatment.
.52	Direct seeding.
.521	Methods.
.522	Protection.
.523	Results.
.53	Nursery practice.
.531	Sowing.
.532	Fertilizing.
.533	Shading.
.534	Irrigation, cultivation and weeding.
.535	Transplanting.
.536	Control of growth.
.537	Temporary storage of stock.
.54	Planting.
.541	Kinds and classes of plant material.
.542	Methods.
.543	Sites and effect of cover.
.544	Care and protection of plantations.
.545	For investment.
.546	For windbreaks and shelterbelts.
.547	For watershed protection (See also 8.7112).
.548	Shade and ornamental trees, hedges, willow holt, etc.
.55	Costs and cost keeping.
.56	Tools and equipment.
.57	Underplanting.
.58	Tree introduction.
.581	Introduction of exotics.
.582	Extension of range of native species.
.59	Tree breeding.
3.0	<i>Forest Protection.</i>
.1	Fire (See also 8.61).
.11	Prevention.
.12	Detection.
.121	Airplane patrol.
.13	Suppression.
.2	Animals.
.21	Grazing animals (See also 9.1).
.22	Rodents.
.23	Birds.

- 3.0 *Forest Protection (Continued).*
 - .3 Tree diseases.
 - .4 Insects.
 - .5 Injurious plants.
 - .6 Climatic injuries.
 - .61 Wind.
 - .62 Snow.
 - .63 Hail.
 - .64 Frost.
 - .65 Lightning.
 - .66 Sun-scald.
 - .67 Floods.
 - .68 Erosion (Including shifting sand).
 - .69 Avalanches.
 - .7 Mechanical injuries.
 - .71 Logging.
 - .72 Guy wires, climbers, etc.
 - .73 Electricity.
 - .8 Chemical injuries.
 - .81 Gases and smelter fumes.
 - .82 Smoke.
 - .9 Trespass.
- 4.0 *Lumbering. Utilization of Major Forest Products.*
 - .1 Logging. Logging Engineering.
 - .11 Log making.
 - .111 Felling.
 - .112 Limbing.
 - .113 Bucking.
 - .12 Transportation of logs.
 - .121 Animal.
 - .1211 Ground skidding, snaking and bunching.
 - .1212 Wheeling.
 - .1213 Trucking.
 - .1214 Sled hauling.
 - .1215 Trail chuting. Trail sliding.
 - .122 Steam, electricity or gas.
 - .1221 Power skidding and aerial tramways.
 - .1222 Logging railroads.
 - .1223 Tractors.
 - .123 Water.
 - .1231 Rafting.
 - .1232 Driving.
 - .1233 Fluming and sluicing.
 - .1234 Barging.
 - .124 Gravity chutes and timber slides.
 - .125 Hand logging.
 - .13 Logging equipment and depreciation.
 - .14 Log grades.
 - .15 Logging costs.
 - .16 Logging administration.
 - .17 Camp management.
 - .171 Camp equipment.
 - .172 Commissary and dietary.
 - .173 Camp sanitation.
 - .174 First aid and medical data.
 - .175 Veterinary data.

- 4.0 *Lumbering. Utilization of Major Forest Products (Continued).*
 .2 Lumber manufacture.
 .21 Manufacturing plant.
 .211 Log storage.
 .2111 Water storage.
 .2112 Land storage.
 .212 Sawmill equipment.
 .213 Conveyor system.
 .214 Power plant.
 .215 Yards.
 .216 Dry sheds.
 .217 Dry kilns.
 .22 Milling.
 .221 Sawing.
 .222 Resawing.
 .223 Edging.
 .224 Trimming.
 .225 Piling and stacking.
 .23 Remanufacture of lumber.
 .24 Other sawmill products. Milling by-products.
 .241 Sash and doors.
 .242 Lath.
 .243 Shingles.
 .244 Flooring.
 .245 Sawdust.
 .246 Wood fuel.
 .25 Disposal of mill refuse.
 .26 Lumber grades and inspection.
 .27 Manufacturing administration.
 .3 Special products (Principally rough wood products, in part from sawmills).
 .31 Poles.
 .32 Piling.
 .33 Logs.
 .34 Cross. ties.
 .35 Posts.
 .36 Pulpwood.
 .37 Mine timbers.
 .38 Shakes.
 .4 Wood-using industries. Uses of woods (For pulp and paper and wood distillation see also 5.22 and 5.23).
 .41 Box and crate.
 .42 Cooperage.
 .43 Furniture.
 .44 Vehicles and implements.
 .45 Veneers, plywood and glues.
 .46 Ship and boat building.
 .47 Shingle.
 .48 Airplane.
 .49 Miscellaneous (Alphabetically by industries).
 .5 Merchandizing or marketing of products.
 .51 Methods of selling.
 .52 Transportation. Freight rates.
 .53 Distribution and markets.
 .54 Shipping weights.
 .6 Lumbering accounting.
 .61 Milling costs.

- 4.0 *Lumbering. Utilization of Major Forest Products (Continued).*
 .62 Selling costs.
 .63 Lumber prices.
 .7 Timber and lumber trade associations.
- 5.0 *Forest Technology.*
 .1 Wood technology.
 .11 Timber physics.
 .111 Wood structure and identification.
 .112 Physical properties of wood.
 .113 Mechanical properties. Timber mechanics. Timber testing.
 .12 Wood chemistry.
 .13 Conditioning of wood.
 .131 Air seasoning.
 .132 Kiln drying.
 .14 Wood preservation.
 .141 Preservatives.
 .142 Methods and costs.
 .143 Treating plants and apparatus.
 .144 Fireproofing.
 .15 Fuel value of wood.
 .16 Wood substitutes.
 .19 Properties and uses of individual woods, foreign and domestic (By genera and species).
 .2 Forest by-products. Derived products.
 .21 Naval stores. Turpentine orcharding.
 .211 Distillation of crude turpentine.
 .212 Methods and costs.
 .213 Possibilities of various species.
 .214 Effect on timber.
 .215 Markets.
 .22 Wood pulp and paper.
 .23 Wood distillation.
 .24 Tan bark and tannins.
 .25 Sugar.
 .26 Rubber and gums.
 .27 Dyestuffs.
 .28 Cork.
 .29 Miscellaneous.
- 6.0 *Forest Engineering.*
 .1 Surveying.
 .11 Land surveying.
 .12 Topographic surveying.
 .2 Mapping.
 .21 Airplane mapping.
 .3 Construction engineering. Forest improvements.
 .31 Roads.
 .32 Trails.
 .33 Bridges.
 .34 Buildings.
 .35 Fences.
 .36 Telephones and telephone lines.
 .37 Heliographs.
 .38 Lookout towers and special protective works.
 .4 Hydraulic engineering (Including reservoirs, dams, and conduits).
 .41 Irrigation.
 .42 Domestic water development.
 .5 Hydroelectrical engineering.

7.0	<i>Forest Management.</i>
.1	Forest mensuration.
.11	Measurement of logs.
.111	Board measure. Log rules. Scaling.
.112	Cubic measure.
.12	Measurement of lumber.
.13	Measurement of other forest products.
.14	Measurement of felled trees.
.15	Measurement of standing trees.
.151	Diameter.
.152	Height.
.153	Volume tables (Alphabetically by species).
.154	Taper tables (Alphabetically by species).
.155	Form factors (Alphabetically by species).
.16	Determination of contents of stands.
.161	Measurement of all trees.
.162	Use of sample trees.
.163	Use of sample plots.
.164	Ocular estimation.
.17	Growth of timber.
.171	Determination of age.
.172	Diameter growth.
.173	Height growth.
.174	Volume growth or increment.
.175	Growth of stands and yield.
.1751	Yield tables.
.1752	Permanent sample plots.
.2	Forest finance.
.21	Forest valuation. Determination of forest values.
.211	Economic and mathematical principles.
.212	Investments and costs in forest production.
.213	Valuation of forest soil. Land values.
.214	Valuation of growing stock or timber.
.215	Valuation of entire forests.
.216	Stumpage values and appraisals.
.217	Appraisal of damages.
.22	Forest statics. Comparison of forest values.
.221	Determination of profits in forestry.
.222	Determination of forest per cent.
.223	Financial test of methods of treatment.
.224	Comparison of forest with agricultural values.
.23	Timber risks and insurance.
.24	Timber bonds.
.25	Forest taxation.
.3	Forest organization. Forest regulation.
.31	Fundamental premises and principles.
.311	The increment.
.312	The rotation.
.313	The cutting cycle.
.314	The normal forest.
.32	Forest working plans.
.321	Forest survey. Timber surveys. Forest reconnaissance. Collection of data.
.322	Determination of methods of treatment.
.323	Regulation of yield. Determination of felling budget.
.324	Control and revision of working plans. Working plan control.

- 7.0 *Forest Management (Continued).*
 - .325 Forest working plans for special areas.
 - .4 Forest administration.
 - .41 Personnel and organization of forest staff.
 - .411 Federal.
 - .412 State.
 - .413 Municipal.
 - .414 Private.
 - .42 Forest business practice. Forest accounting.
 - .421 Federal.
 - .422 State.
 - .423 Municipal.
 - .424 Private.
 - .43 Forest equipment (Includes all general equipment; for special technical equipment see specific captions).
 - .5 Farm and woodland forestry. Wood fuel reserves.
- 8.0 *Forest Economics (For forest statistics see individual topics on which statistics are desired).*
 - .1 Forest influences.
 - .11 Climate.
 - .12 Soil.
 - .13 Water resources and streamflow.
 - .14 Erosion.
 - .15 Avalanches.
 - .16 Public health.
 - .17 Ethics and morals.
 - .18 Forest aesthetics.
 - .181 Forest parks.
 - .182 Shade trees and city parks.
 - .183 Shade tree pests and diseases.
 - .184 Shade tree care. Tree surgery.
 - .2 Lumber and timber economics.
 - .21 Timber supply.
 - .22 Production.
 - .23 Consumption. Demand for forest products.
 - .24 Lumber trade.
 - .3 Industrial relation of forests.
 - .31 Wood-working.
 - .32 Agriculture.
 - .33 Railroading.
 - .34 Mining.
 - .4 Forest resources. Forest conditions. Forest production.
 - .41 United States (Alphabetically by states).
 - .42 Foreign countries (Alphabetically by countries).
 - .5 Tariff on lumber and forest products.
 - .51 Exports.
 - .52 Imports.
 - .6 Forest legislation (Alphabetically by countries and states). (For game and fish legislation see 8.712.)
 - .61 Fire.
 - .62 Tax.
 - .7 Forest policy.
 - .71 National forest policy.
 - .711 Utility of national forests.
 - .7111 Timber production and silvicultural policy.
 - .7112 Watershed protection.
 - .7113 Waterpower development.

- 8.0 *Forest Economics (Continued).*
- .7114 Public use and recreational purposes.
 - .7115 Use of agricultural lands.
 - .7116 Use of grazing lands and grazing policy.
 - .7117 Use of mineral lands.
 - .7118 Other uses.
 - .712 Game and fish policy (See also 9.2).
 - .713 Educational policy.
 - .714 Development of science by investigation and research.
 - .715 Cooperation and demonstration.
 - .716 Regulation of privately owned forests.
 - .72 State or provincial forest policies (Alphabetically by states and provinces).
 - .721 Land policy.
 - .722 Silvicultural policy.
 - .723 Grazing policy.
 - .724 Educational policy.
 - .725 Cooperation and demonstration.
 - .726 Regulation of privately owned forests.
 - .73 Municipal forest policies (Alphabetically by states or provinces and municipalities).
 - .74 Private forest policies (Alphabetically by states or provinces and individuals or corporations).
 - .75 Foreign forest policies (Alphabetically by countries).
- 9.0 *Miscellaneous Uses of Forests.*
- .1 *Grazing.*
 - .11 Livestock industry.
 - .111 Cattle and horses.
 - .1111 United States (Alphabetically by states).
 - .1112 Foreign countries (Alphabetically by countries).
 - .112 Sheep and goats.
 - .1121 United States (Alphabetically by states).
 - .1122 Foreign countries (Alphabetically by countries).
 - .12 Range plants (Alphabetically by species). (For arborescent species see 1.1.)
 - .121 Identification.
 - .122 Distribution.
 - .123 Phenology.
 - .124 Forage value and other economic importance.
 - .125 Poisonous plants (See also 9.1534).
 - .13 Forage types.
 - .14 Systems of range allotment and control.
 - .15 Range management.
 - .151 Grazing working plans.
 - .1511 Range reconnaissance and surveys.
 - .1512 Control and revision.
 - .152 Range utilization and maintenance.
 - .1521 Adaptability of range to different classes of stock.
 - .1522 Seasons of grazing.
 - .1523 Carrying capacity.
 - .1524 Intensity of grazing.
 - .1525 "Deferred and rotation" grazing.
 - .153 Range improvement.
 - .1531 Natural revegetation.
 - .1532 Artificial reseeding.
 - .1533 Range destroying rodents.
 - .1534 Eradication of poisonous and unpalatable plants.

- 9.0 *Miscellaneous Uses of Forests (Continued).*
 .154 Range development. (For engineering features see 6.0.)
 .1541 Drift and division fences.
 .1542 Stock watering places.
 .1543 Stock trails and driveways.
 .1544 Corrals, chutes, dipping vats, etc.
 .155 Handling stock.
 .1551 Cattle.
 .1552 Horses.
 .1553 Sheep.
 .1554 Goats.
 .156 Breeds and breeding.
 .1561 Improvement in grade of stock.
 .157 Feeds and feeding.
 .158 Livestock enemies.
 .1581 Diseases.
 .1582 Insect pests.
 .1583 Predatory animals.
 .16 Grazing influences.
 .161 Forest growth and reproduction.
 .162 Forest fires.
 .163 Watershed protection.
 .1631 Erosion and streamflow.
 .1632 Landslides and avalanches.
 .1633 Water for irrigation and municipal supply.
 .164 Soil fertility.
 .165 Game.
 .166 Recreational use.
 .17 Range economics.
 .2 Game and fish (See also 8.712).
 .21 Studies of species (Alphabetically by species).
 .22 Game and fish administration.
 .221 Laws and regulations.
 .222 Cooperation (See also 8.715 and 8.725).
 .223 Refuges.
 .23 Game and fish management.
 .231 Game census.
 .232 Natural enemies.
 .233 Regulation of kill.
 .234 Extension.
 .235 Restocking.
 .3 Waterpower development (See also 6.5).
 .4 Mineral resources (See also 8.7117).
 .5 Recreational uses (See also 8.7114).
 .51 Camping and outdoor life.
 .52 Hotels and other forest recreational centers.
 .9 Other special uses.

BATES FOREST

ACQUISITION BY BATES COLLEGE AND FIRST STEPS IN MANAGEMENT

BY RAYMOND E. RENDALL

Manager

The greater part of the timberlands of the Bates forest are situated in York County, Maine, with Alfred, the shire town, as the geographical center. The area is divided into a large number of so-called lots, some of which are more or less grouped, scattered over several towns within a radius of 15 miles of Alfred. Three lots each are situated in New Gloucester, Cumberland County, and in Livermore, Androscoggin County. Important to management is the general location of the forest. Railroads, highways, and woods roads make all lots easily accessible, both from the standpoint of administration and protection. Alfred is within short distance of market centers, being on the Portland, Rochester & Worcester division of the Boston & Maine Railroad; 34 miles from Portland, Maine's largest city, and 20 miles from Rochester, N. H., and about 100 miles from Boston. Sanford, which claims to be the largest town in the State, is four miles from Alfred. Here are located the Sanford mills, makers of velvets, plushes, etc.; Goodall Worsted Company, manufacturers of Palm Beach cloth; one of Sears-Roebuck shoe factories, other mills and industries. From Sanford to Kennebunk runs the Atlantic Shore Line Railway which passes through or near several of the Bates forest lots.

Mr. Benjamin Clark Jordan, a lumber dealer and owner of extensive forest land chiefly in York County, Maine, died December 12, 1912. At this time he left a will conveying several thousand acres of timber land to Bates College of Lewiston, Maine. This generous bequest was subject to the life estate of his daughter, Miss Nellie B. Jordan. Mr. Jordan in his will stipulated that Bates College, in receiving these lands, "should found and support a Department of Forestry in said College, that all growth land be retained, cared for, timber cut and disposed of, by said Bates College, in accordance with the most approved methods of modern, scientific forestry." In January, 1918, the daughter waived her life interest in these lands and deeded her rights to Bates College. These rights have been used since this time.

Up to the summer of 1921 forest management was confined to conservative cutting, operating to a diameter limit of 10 inches and avoiding any centralization of the cut.

In conformity with the terms of the will, there was founded at Bates College, in September, 1918, a Department of Forestry under L. R. Grose. In the fall of 1920 Mr. Grose was succeeded by Bernard E. Leete. Mr. Leete first took measures to remodel some of the existing courses and fully equipped the Department that a first class professional four-years course in forestry might be given. This course included a summer camp conducted on the Bates forest. Next, Mr. Leete gave his attention to the college timber lands and made plans for placing the lands under distinct forest management.

Preliminary to placing the lands under forest management was the necessity of obtaining a complete forest survey which would include data upon which should be based a preliminary working plan. Such a plan was drawn up for the definite purpose of establishing and maintaining a sustained yield, protecting existing growth against fire, insects, and fungi and for the utilization of the forest products.

In collecting these data, the following information was obtained:

1. A 10 per cent estimate of merchantable stands of timber.
2. A complete description of each lot, separated by types. This description was made with reference to the ground cover, presence of insects, fungi, etc., and the condition of the existing growth.
3. A complete type map showing the distribution of species on each lot. For this purpose, the following recognized types of forest lands have been used:

Permanent Types

1. Hemlock
2. Pitch pine
3. White cedar swamp

Temporary Types

4. Pure white pine
5. Pine and inferior hardwoods
6. Mixed hardwoods
7. Soft maple swamp
8. Waste land
9. Open land
10. Spruce swamp
11. Alder or brush
12. Fresh-water marsh or swale
13. Red or Norway pine

4. The topography on each lot.
5. A summary showing the condition of each lot, with reference to the present and future possibility of operating for an income.

Such a survey was made, continuing with but few interruptions, from July 1 to November 1, 1921. Before further describing this survey it may be well to give a brief sketch of the life together with

some of the practices of B. C. Jordan, the donor, through whose generosity together with the kindness of his daughter, Bates College has come into possession of what promises to be timber lands of exceptional value.

Mr. Jordan had always been a natural practicer of forest conservation. He was very apt to experiment in various methods of cutting and did from time to time reforest many of his lands. Some of his observations as recorded in his biography will best illustrate his knowledge of forestry principles.

"If timber land in York County is cut right and the small trees carefully saved, a fair crop can be cut as often as once in twenty years. Where everything is cut or destroyed it will be fifty years before there is anything fit to cut for timber. The explanation for this difference in time is that when the small trees are left they take possession of the ground, and being above the sprouts and seedlings are not hindered in their growth by them. The small trees thus having plenty of room, grow very rapidly. A pine tree, twenty years from the seed, under the most favorable conditions, is too small for timber. But in twenty years more, if it has room to grow, becomes a pretty good timber tree. In removing the timber from the lot at least one small tree on every square rod of the lot should be saved for timber. The owner himself can skilfully and carefully cut out the defective and inferior trees for fuel or fencing so as not only not injure the growth but would actually make it improve faster. Not more than one large timber tree to the square rod can grow to maturity, but small trees can be coming forward. One tree on each square rod on the average would be 160 trees to the acre. Very few lots, however, have so many as 160 good timber trees to the acre, though they may have that number. Most lots have more or less vacant places, where there are no valuable trees. This could be remedied by setting out trees of the most valuable kind."

Mr. Jordan thought that about a cord of timber grows on an acre of good growing timber land in a year. In other words, about 250 feet or about one-half cord in logs and the other half in the tops, that would not be available in selling timber by the thousand. Up to March, 1911, records show that Mr. Jordan had set out in all some 50,000 white pine plants.

From time to time as Mr. Jordan acquired lots of timber, he had lines run out from the deed descriptions and maps made showing boundaries and adjoining owners. In 1907 these individual maps were reduced to one scale and a map made showing the relative location of one lot to another. In the field a majority of the lines were blazed

and at nearly every corner substantial square granite posts were set.

The availability of such maps and the clarity of the lines on the lots helped greatly to minimize the cost of the forest survey. In making the survey, a large map showing the relation of one to another was used as a key map. Each lot has been given a serial number. These numbers are so classified that they are distinctive of the geographical location of the lots to which they refer. By this means and by further sub-division it is possible to separate the lots into working units, blocks, compartments, sub-compartments, etc. In every case an index of the serial number is kept with reference to the original lot name and original map number. It is a part of the future plans to reblaze all lines and renew all witness trees, place corner posts where none are present, and give each corner post a representative serial number which for purposes of identification will be placed on the stones and on the maps. In the field work covering the forest survey strips were run over each lot. Lines were run by compass and steel tape parallel to some natural boundary. These strips were one chain wide and spaced ten chains apart. In this way 10 per cent of the area was covered. On these strips detailed information was collected and recorded on a forest description sheet.

Field maps were prepared on a convenient scale, 40 rods to the inch. Estimates were made in the following manner: All softwood trees with a diameter above 10 inches d. b. h. were tallied by diameter and height and trees with diameters from 6 to 9 inches were grouped together. In the absence of home-made yield tables, the volume tables as given in Hawley's "Forestry in New England" were used. For hardwoods only trees containing merchantable logs were tallied and this was done by taking top diameters and log lengths, basing the estimate on the local log scale. In recording tallies, distances traversed were kept and whenever the type changed a new tally was started. In this way the estimate was kept by types and stands.

From the figures and information obtained in the field, a preliminary working plan was drawn up. This plan was combined with a general report of the condition of the lands of the Bates forest and recommendations for their management. The plan itself deals with the management of the area as a whole and with each type in detail. Of the types found present, white pine is by far the most important from every standpoint. Because of its high value, its rapid growth, and ability to thrive on relatively poor soils it will be the object of management to perpetuate this type where it now exists and extend it to new

areas now occupied by other types but adaptable to the growth of white pine. In all cases regular even-aged stands will be worked for. A fifty-year rotation has been decided upon as best considering local conditions and for the best development of the pine. The present plans of management are to so build up the lots that they may be self-sustaining. For the time being stripped lots coming up to a general mixture of hardwoods will be neglected. The various swamp types containing spruce and cedar will be exploited to obtain special products such as posts, poles, and piling. From the estimates of merchantable stands of timber volumes of the various species were figured. Then for the purposes of regulation, to determine the amount of annual cutting, the annual yield was figured and corrected, based on Von Mantel's formula. The problem would not be great to manage the lands containing merchantable stands of timber. These stands compose a little over 30 per cent of the whole area, while the remaining 70 per cent is nearly half waste land or land that has been burned over or stripped, the other half being covered with a sprout hardwood growth, through which is a general scattering of merchantable pine trees.

First steps toward regulation have been applied to logging operations conducted on the first named division. In order to avoid any further depletion it is necessary that the amount cut shall be minimized and regulated, based upon a period that will allow fully for a regeneration of the so-called stripped lands. The expenses of the Bates forest are necessarily large and a minimum cut of merchantable stands of timber is inadequate to cover these. The sale of forest products is the only source of revenue, making it necessary to market heavily other special forest products such as cordwood, posts, poles, and piling, and obtain receipts from leases, etc.

In regulating the timber sales no definite silvicultural system has been followed, but two methods of marking have been employed. The various lots logged have contained a representation of nearly every type of timber common to this region and all stands of softwood growth have for the most part been un-evanged. Because of this, the first consideration has been to so cut the timber that the lots would be built up and gradually bring them into such shape as to permit of the establishment of a sustained yield. One method has been to mark all suppressed or deformed trees, all matured and over-matured trees with the exception of certain matured trees having well-formed crowns, which would be advisable to leave for seed. Where possible

co-dominant and intermediate trees have been thinned. Under this method all trees of the lower diameter classes have been left for future marking. The second method has been to reserve certain portions of the cutting area for the purpose of retaining the forest cover, furnish seed and form windbreaks. Cutting has been restricted to trees above a 10-inch diameter limit breast high. White bands have been painted around trees that were further wished to be reserved. This latter method has worked out well where the greater part of the stand has been composed of over-matured or decadent growth; good results have been obtained and choppers have been as well satisfied as though they were allowed to clear cut.

Forest management on the Bates forest in the true sense of its definition, began in January, 1922. Four logging operations have been conducted, ranging in size from cuts of from 100,000 feet up to 500,000 feet. On one lot the total cut of over 280,000 feet was taken from a cutting area of 32 acres. The first method of marking described above was employed. Trees to be cut were blazed and stamped with a B. C. monogram at breast height and below stump height. That the purchaser might feel secure in planning his operation, the contract stated "that not less than 60 per cent by volume of the total stand of merchantable live timber on the designated area, in trees 10 inches and over at a point $4\frac{1}{2}$ feet above ground will be marked for cutting." On this particular sale nearly two-thirds of the merchantable timber was cut. The merchantable timber left, together with trees of the younger age classes, constitute a growing stock that should maintain itself. Such a partial cutting costs slightly more than would stripping or clear-cutting, but the operator is agreeable to this extra cost. This because he is sure of his profit in logging of the merchantable growth and he risks no investment in getting out trees of the smaller diameters. Also, of course, is the fact that in obtaining trees of the larger diameter he is sure if present of obtaining trees that will produce the best quality lumber. Then again if the lumberman is a permanent operator he will plan on the future possibility of once more obtaining a timber supply from the lands where such management is practiced. As soon as logging was well under way brush disposal was begun. This was confined to 26 acres from which is estimated to have been cut 230,000 feet. One man was employed in this work. In 104 days this man put up 156 cords of top wood. Cost of labor was \$3 per day. Thus the cost of putting up one cord of the top wood was \$2, or on the

basis of top wood from each thousand feet of logs obtained, it would be about \$1.35 per thousand. Market conditions are favorable in this region for pine tops, so-called, and a profit of from 25 to 50 cents per cord is possible. The one drawback to this procedure is the obtaining of dependable labor. Unfortunately, the average man cutting tops by the day who is willing to spread the remaining slash and cut out all the available wood is hard to find. He can be hired by the cord, the going price being \$1.50, but in this case it is hard to force him to cut the wood down to a small size and impossible to force him to spread the slash properly. The ultimate alternative is to sell the lot of pine tops outright and make the price attractive enough so that the buyer will spread the slash according to your wishes. After cutting out the wood, the remaining debris which is too small to be utilized for fuel should be scattered over and next to the ground, and in this case was so handled. In this condition the resulting slash from logging should decay in half the time it usually takes for such material, besides lessening the fire hazard and hindrance to reproduction. The above method of slash disposal is possibly not the best, but it is the cheapest and may prove to be practical and efficient. It is the plan of future management to attempt other methods of slash disposal, but at present initial costs are prohibitive. Burning in this region does not seem to be very practicable; it is possible in the winter months as logging is in progress, but during the rest of the year it would become a menace to reproduction and cause a fire hazard.

Plans of management not only apply to the lands, but they include provision for the support of a Department of Forestry at the college. Due to the necessity of keeping all expenses and costs of administration to a minimum, the four-years' course leading to a degree of Bachelor of Science in Forestry was temporarily discontinued after June, 1922. Since that time a cultural course has been instituted. Three hours a week through one semester are offered, elective to all students. This course will deal with the general aspects of forestry in the United States, particularly discussions regarding local and State forestry needs. Occasional lectures will be given by the manager of the Bates forest, lumbermen, and available men prominent in forestry work. In discontinuing the professional course in forestry it is the purpose of the college to so concentrate the management of the forest areas that they will be of demonstration and educational value. Of first importance is the necessity of meeting the current annual expenses,

such as taxes, annuities, administration costs, etc. To meet such expenses, it is necessary to obtain a sustained annual yield as quickly as possible. A part of the required income will be derived from sales of merchantable timber, supplemented by sales of special products. Once a sustained yield sufficient to cover the annual expenses is established, scientific studies will be made and experimentation carried on. The necessity for large immediate revenue from the lands will not permit ideal management. This because the older age classes are already far below what they should be in volume and heavy cutting, even on a small scale at the present time, will further defer the time when a well regulated forest business can be established. Conditions are, however, favorable for intensive management. In general, white pine stands will be worked for. Hardwoods will be replaced with pine wherever practical and consistent with site conditions. There are exceedingly large areas which must be reclaimed, but first attempts at reforestation will be concentrated on open fields, leaving the waste lands until such a time as the management shall have surplus funds. In addition to planting, protection costs are important and to a certain extent must be met and included in the annual administration costs.

Under protection, probably of first importance is the prevention and control of fire. On the Bates forest fire danger is minimized. This because the lands themselves are divided into many parcels and further because they are almost without exception in close proximity to some town or village and easily accessible by the many State, town, and logging roads. Little damage was done during the 1922 fire season. The greatest damage was suffered by the reproduction. In all an area of only 25 acres was burned over in five separate fires. Fire-damaged timber was largely pitch or hard pine which has been sold without any great sacrifice in the stumpage price. Of the five fires, two were started from sparks from a portable mill, one from sparks from a railroad locomotive, one was accidental, and one unknown. Fires, in a more or less settled community, usually do not cover large areas because of the availability of fire fighters. On the other hand, fires spread before any attempt is made to put them out. People are not concerned at the sight of smoke unless it is near at hand. They think that others are looking after the fire, wherever it is. Such a condition could be remedied by having a patrol during the fire season. This patrol could be one man who would spend his whole time searching over a definite area for possible fires. He should also be vested with

the authority to enlist the services of fire-fighters, have control of their work, and cooperate with the local fire wardens.

The greatest damage to forest trees from insects is without a doubt caused by the gipsy moth. A large percentage of the white oak has been killed by repeated defoliation. Damage by the gipsies is by no means confined to the white oak. Nearly every species of both hard and soft wood is now being attacked. In this section, devastation was light during the past season, due in part to the exceptionally wet spring. Control by private owners is practically impossible and it is hoped that the U. S. Department of Agriculture will continue in its work of liberating colonies of parasites. Upon investigation, egg parasites were found to be present in one section of the Bates forest. This parasite was identified as *Anastatus bifasciatus*.

In raising white pine there are two weevil pests that render its propagation and growth difficult. The Pales weevil is perhaps the most serious as it attacks reproduction so vigorously, killing it in a very short time. Control is limited. Entomologists have made studies and found that the odor from the pitch of stumps, slash, and lumber of cut-over areas attract the weevil. At present as much of the slash as possible will be removed to help reduce the amount of attraction. In the future it is hoped that some economic process of burning can be arrived at. The white pine weevil is a pest that, while it seldom kills a tree, does so deform it that is suitable only for a cheap quality of lumber. To combat this pest which destroys the terminal shoot, the plans are to collect the weevil-infested tops and from them breed parasites which when liberated will check the spread, thereby insuring a growth of quality timber.

During the last few years the white pine blister rust has been spreading throughout the white pine region of Maine. Infection either on pine or on the currants and gooseberries is everywhere prevalent on the Bates forest. Whenever it is found on the pine it is removed. Government scouts have pretty much covered this territory and located patches of wild ribes. These patches together with patches found during the forest survey and others located later will be eradicated. The first work will be carried on where the plants are found within a short distance of pine growth. Last season over 7,500 plants were removed from an area of about 100 acres. This was done at a cost of \$40, representing the labor of four men for three and a third days each. Supervision of these men was furnished either by the town in the region where eradication took place or by the management of

Bates forest in cooperation with State and Federal blister rust control. These figures represent a cost for eradication of approximately one-half a cent a plant, or in the basis of acreage, 40 cents an acre. This cost per acre would be less if necessary acreage covered prior to pulling of ribes was accounted for.

In the past season two important steps have been taken toward establishing a planting program. First has been the setting out of a three-year-old pine plantation and second the making of a white pine nursery. In making the plantation, 7,000 three-year-old transplants were used. The stock was obtained from the Bates College nursery at Lewiston, Maine. Total cost of establishing the plantation, based on one thousand plants, is as follows:

Assumed cost of raising.....	\$10.00
Total costs preparatory to planting.....	8.28
Planting costs, including administrative expenses.....	10.26
Protection costs, including fence repairs and equipment for spraying for gipsie moths.....	1.03
	<hr/>
	\$29.57

This plantation was set out during the second week in May, which was immediately after the frost was well out of the ground. Weather conditions for planting were ideal. Each day it was either cloudy or rainy. For setting the plants holes were made with a mattock, roots were kept well moistened, and the soil was tamped in around them. In the fall an inspection revealed that less than 1 per cent failed to establish themselves.

In establishing a nursery, a site was chosen on an old field near a main road, a short distance from Alfred. Site and soil conditions are comparable to the average for the forest. Pine growth is in close proximity on the north and west sides, while on the south and east sides it is but a hundred yards distant. Through the field is a 15-year-old pine plantation with spacing between trees of one rod. These trees, with this spacing, show thrifty growth, but are without exception weevil deformed. The soil is a loamy-sand and well drained. In preparing the seed beds all turf was removed and the soil well worked over to a depth of several inches. Ten beds were made of a size 4 by 12 feet, and elevated above the paths to the height of the curbing which are four inches; soil being taken from the paths for this purpose. Seed beds were sown broadcast a month after the frost was out of the ground, which was during the first week in June. To protect the seed

from birds and rodents, lath screens were used, every other lath being nailed. The alternate laths were laid without nailing. Germination took place within three weeks, at which time the lath frames were raised several inches, cloth screening being used to cover the sides. The alternate laths were removed as soon as the seedlings were well above the ground. The seed beds have been kept well watered and weeded. In the fall the lath screens were removed two weeks prior to mulching for the winter. Cost of establishing this nursery on a plot 18 by 24 feet: Preparation, building of beds, frames, planting, etc., including administration, \$77.74; five pounds of seed, \$10.00; total, \$87.74.

One man is kept on the forest the year round for general purposes. His work consists of slash disposal, running of lines, ribes eradication, assistance in planting, work in thinning and weeding, nursery work, etc. In conclusion it may be stated that every effort will be made to manage the Bates forest so that it will not only be a commercial success, but that its growth will be perpetuated and the results of its management be available to all concerned in forest growth.

THE RELATIVE UNIMPORTANCE OF PROTECTION AND SILVICULTURE AS COMPARED WITH SUSTAINED YIELD¹

BY KARL W. WOODWARD

Professor of Forestry at New Hampshire State College

The profession should take great pride in the present achievements in protection and silviculture. Here in New England, in spite of occasional "flare backs" in political policy, we have progressed to the point where we know what needs to be done to protect our forests and how much it costs. We are even outgrowing our "minimum silvicultural requirements" so rapidly that the officials charged with their fashioning must make haste or the clothes will have to be passed down to the next one in the family.

The best evidence that we are stretching up is that it is possible to start an acrimonious discussion on such moot questions as brush disposal, number of seed trees, and the like without half trying. In fact we have reached the stage where we are ready to fight for our particular kind of "medicine" to the last ditch. If one may judge by the written reports of the recent Western Conservation Congress this is not a purely local phenomenon. E. T. Allen's plea for cooperation sounds as if there had been somebody with very definite ideas as to how the world was to be saved. His argument for a becoming modesty is certainly sound historically. The trail of progress is strewn with the wrecks of wonderful ideas which have been useful and yet had to be thrown aside when they had served their day. There is nothing surer, for example, than that when the smoke of the brush burning squabble clears there will be no problem because close utilization will leave no brush to dispose of. Again, to be torn by conflicts as to whether one or four seed trees per acre is sufficient is futile, because we will soon be ready for better methods of natural regeneration. In fact there seems to be but one criterion that offers even faint hope of being a permanent goal. By using the measuring stick of sustained yield we will at least get some notion of the relative importance of protection and silvicultural measures.

¹ Presented at the annual meeting of the Society, at Boston, December 29, 1922.

Furthermore, by emphasizing the larger aspects of our problem its discussion will be immediately raised from the low level of a family squabble to the purer atmosphere of economic discussion. Sociologists are not interested in the number of seed trees needed per acre but they are much concerned over the effect of a nomadic lumber industry on our institutions and habits. The general public cares nothing about the cost of brush disposal. It merely wants cheap lumber. Any discussion of brush disposal which does not keep this constantly in mind immediately loses its interest as a public question and becomes a private scrap in which the spectators are only anxious to see hard punching with no serious infringement of the Marquis of Queensbury rules. Think what a wonderful thing it would be to put across the idea that forestry means more logs for the sawmill man! Is there any other way of doing this than by keeping constantly in sight the ideal of sustained yield?

Unless this is done how are we to know the by-path from the main road? They both start small and the by-path frequently looks shorter or smoother or easier. The classic example of the danger of setting too low standards is the religious reformer who was willing to do all in his power to convert the heathen even if it was necessary to kill them. Think what a travesty the homestead law has become where its underlying purpose is lost sight of! The only thing that matters is the sound development of the community and yet the homestead law has been on occasion the main stumbling block. It is behind such barriers that the forces of conservatism entrench themselves. They cannot see the forest for the trees. A measure has proven good. Therefore it must always be applicable. The underlying principle they cannot see. It is more "practical" to do as their fathers have done.

Lookout towers, speeder patrol, brush burning, scattered seed trees are merely means to an end. Sometimes they are good, sometimes wholly bad. Sustained yield is all that counts.

AN INTERESTING AREA OF LIMBER PINE EXTENDING INTO SOUTHWESTERN NEBRASKA

BY L. N. GOODING

An area of limber pine (*Pinus flexilis* James) exists in the extreme southwestern corner of Nebraska near the line of the Union Pacific Railroad and extends about 35 miles into adjacent Wyoming and Colorado. The occurrence of this species in Nebraska appears to have escaped the observation of botanists, although it was reported from the Pawnee Buttes region of Colorado in 1907 by Ramaley and Robins,¹ and in 1917 in a map by Sudworth.² This body of pine is isolated from the nearest limber pine of the Rocky Mountains by about 60 miles of treeless plains or rolling country, broken only by comparatively shallow draws.

The limber pines are confined to the broken country along the bluffs of Lodgepole Creek and are encountered at their southern extremity about two miles west of Pawnee Buttes, Colorado. Here the bluffs have a southern exposure. From a point about eight miles southeast of Grover, Colorado, the bluffs face the west and with the exception of the exposures along Lodgepole Creek continue in a northerly direction until they merge into the plateau north of Pine Bluffs, Wyoming.

The bluffs represent for this section the western out-cropping of the Ogallala formation of the Pliocene. They are composed of a conglomerate material cemented together by lime. The surface or capping is quite hard and prevents the rapid erosion of the much softer underlying material. The elevation of this region is 5,200 feet or less. The mean annual rainfall in Kimball County, Nebraska, is about 16 inches with extremes of 9.48 inches to 25.59 inches.

North of Lodgepole Creek the limber pines are scattering and associated with western red juniper (*Juniperus scopulorum* Sargent). Directly south of Pine Bluffs the predominant species is western yellow pine (*Pinus ponderosa* Laws) with a slight mixture of limber pine. To the east of the town the yellow pine is gradually replaced by limber pine, the latter finally forming a pure stand. Curiously, it

¹University Studies of Colorado, IV, p. 162.

²The Pine Trees of the Rocky Mountain Region, U. S. Dept. Agri. Bull. 460, Map No. 2.

creeps down on the slopes and points considerably lower than the yellow pine, some of the trees growing at an elevation of 5,000 feet or less. The most extensive stands and best growth are found in Nebraska about two miles east of Pine Bluffs. Along the bluffs extending to the south yellow pine remains the predominant species for perhaps ten miles. The limber pine is represented at first by only an occasional tree, gradually becoming more and more plentiful. South of a slight gap in the bluffs near the Colorado-Wyoming boundary line the yellow pines disappear entirely and the only trees found are the limber pines and western red junipers. In the southern part of the area the growth is scattered over a considerable portion of some of the draws and canons. In the immediate vicinity of Pine Bluffs, Wyoming, the limber pines are scattered over a belt 5 to 6 miles wide.

Residents of this region state that the early settlers cut most of the original pine stand. However, south of Pine Bluffs there are many old yellow pines, but the writer saw only three old limber pines and very few occur on the entire area. In the pure stands of limber pine in Nebraska there are a few old stumps, but on the eastern-most points all the trees are young. If it were not for the fact that the seeds of this pine are very large and the means of dispersal for considerable distances not apparent, one would be likely to conclude that this entire area was a comparatively recent invasion. In the writer's opinion the excellent growth and extensive reproduction indicates that at least the species is not a disappearing one. It may be that the original stand was a geologic remnant isolated during the ice period which has since managed to maintain itself.

As a result of the observations made on this area, it is perhaps worthy of note that Professor W. J. Morrill, the State Forester for Colorado, has decided to try the limber pine as a wind-break tree in the plains of eastern Colorado and for this purpose has distributed 500 trees to settlers. F. R. Johnson, of the United States Forest Service, who has charge of planting in the Rocky Mountain district, also has decided to give the limber pine a trial in the Nebraska National Forest at Halsey.

THE SOLUTION OF SOME FOREST NURSERY PROBLEMS

BY GEO. S. PERRY

Pennsylvania State Forest Academy

CONTROL OF MAY BEETLE LARVÆ

In nearly every forest nursery, larvæ of the May beetles or "June bugs" (*Lachnosterna* spp.) are a more or less serious pest. Injury from this source is usually much underestimated. Damage by the small grubs during their first year, especially in early spring, is commonly attributed to other troubles. Roots of seedlings one year or less in age are then girdled and stripped of their cortical and cambium layers; while recently germinated seedlings are pruned constantly and with increasing severity of fine rootlets. "Damping-off," "root-rot," "sunscald," and other troubles of soil or climatic origin are all blamed for the sickly appearance or loss of small trees when white grubs are the primary causal factor.

The direct injury from the attack of larger grubs is usually readily recognized if damaged trees are studied, or it may be only too obvious when the seedlings are pulled bodily down into the ground. Yet even in this stage of their life cycle grubs are a contributory or indirect cause of many nursery troubles. All in all, it is safe to state that during the past three seasons white grubs have been by far the greatest cause of seedling loss in most sections of the Mont Alto Nursery.

Standard methods of combatting the May beetle larvæ (U. S. D. A. Farmers' Bulletin No. 940) are either impractical or prohibitively expensive in a forest nursery under intensive management. The proposed use of sodium cyanide seems to promise results but is both expensive and dangerous. The Mont Alto Forest Nursery has been continuously operated by the Pennsylvania Department of Forestry for twenty years, and has periodically suffered seriously from white grubs. It is located at the eastern edge of the great agricultural Cumberland Valley and entirely surrounded by hardwood forests; thus showing ideal conditions for flight and feeding of the adult beetles.

In 1920 we chanced to have in the Mont Alto Nursery two blocks

of white pine beds growing under similar conditions, except that one was located on a site planted to white ash the previous year. Quite a few ash seedlings appeared in this block of pine beds as volunteers and were allowed to remain because of a general shortage of hardwood stock. Now the white grubs were very abundant in the coniferous beds that season and destroyed approximately 25 per cent of the seedlings in the block without intermixed volunteer ash; while in the other block not a single pine seedling showed injury! But it was obvious upon inspection of the ash that larvæ were present in considerable numbers, and that their natural preference for the roots of the ash had served to protect the white pine. However, the white ash itself really suffered little, because of its aggressive growth under irrigation and ability to replace quickly such roots as were eaten off.

Later work along the line above indicated shows that 25 to 40 seedling ash to 100 square feet of bed space will under ordinary conditions protect white pine and Norway spruce seedlings perfectly against the ravages of the species of white grubs present at Mont Alto. In two-year-old beds of these conifers the number of ash seedlings may be diminished at least 50 per cent and still afford practically perfect protection. American elm seedlings have also been used to decoy grubs away from white pine and Norway spruce.

Protection of larch and bald cypress seedlings is more difficult than for other conifers, since they are also preferred by the larvæ, but it is only a matter of learning more of this feature of host preference.

BROADCAST SOWING OF HARDWOODS

In Pennsylvania State Forest nurseries for a number of years practically all conifers have been grown broadcast in carefully prepared standard beds (25 by 4 feet), while hardwoods were generally sown in long drills for horse or wheel-hoe cultivation. Except possibly with tulip poplar, the nurseries attained a certain degree of success with all the more important eastern hardwoods; yet at the expense of much wasted seed and ground space. Sugar maple and other tolerant species responded very poorly, chiefly because of lack of shade and proper timely cultivation. A recent effort to grow all the common hardwoods in beds, handled in about the same way as for conifers, has been attended with such success that drill-sowing and horse-cultivation is being entirely abandoned at Mont Alto.

The advantage of the "broadcast bed" compared to wide drill-sowing is best illustrated by data on sugar maple: One-year-old maple seedlings in the wide drills had an average height of two inches compared to nine inches in the beds. Then from a pound of seed ten times as many seedlings were grown as could be secured in the wide drills. The difference in favor of the beds is not so marked with such species as black walnut, except in economy of space and weeding labor.

HANDLING TULIP POPLAR IN THE NURSERY

Successful production of tulip seedlings has always been a problem in Pennsylvania nurseries. The solution seems to depend upon attention to three requisites of the species:

(1) Seed must not become desiccated. It must be planted in the autumn or stratified in moist sand until spring; otherwise loss of viability or slow and irregular germination will result.

(2) Viability seldom exceeds 30 to 40 per cent and may be less than 1 per cent. Careful inspection of the seed in order to sow a sufficient quantity is therefore a necessity to the attainment of full stands in the seed beds.

(3) If seeds are sown in autumn, heavy mulching is essential to the maintenance of conditions most favorable to tulip seed, as it seems adversely influenced by frequent, sudden and extreme temperature and moisture fluctuations.

Attention to the foregoing details makes it as easy to grow tulip poplar seedlings as those of any other hardwood; but this species has always been considered difficult to transplant, and it undoubtedly is if the work be unseasonably executed. However, for a period of about two weeks each spring it is possible to move this tree with nearly 100 per cent success. Loss of transplanted tulip trees is usually due to the decay of their characteristic fleshy, fibrous roots when these are injured in any way. The most vigorous root growth is made just prior to leafing out in the spring. If seedlings are moved at this favored time, just after the buds begin to swell, broken roots will be quickly repaired or replaced, that loss will be inconsequential where correct methods are used.

REVOLUTIONIZING NURSERY PRACTICE¹

By W. G. HASTINGS

Chief Forester, State of Vermont

Nursery stock for reforestation purposes costing \$7 per thousand trees at the nursery means a cost to the land owner of \$10 per acre at his railroad station, including freight. Ten dollars per acre is too much money to put into raw stock and expect every owner of wild land to be interested in reforestation through the planting of trees. However, interest must be created for there is a greater acreage of *waste* land in Vermont upon which natural regeneration cannot take place within a reasonable length of time than there is of *timber* land in need of silvicultural treatment. Whatever your individual opinion may be concerning the need of or desire for the redemption of land now waste, or concerning seeding versus planting as a means of such redemption, the fact remains that Vermont, wittingly or otherwise, has established a rather definite policy of reclaiming waste lands through the planting of nursery stock. Also, whatever your individual opinion may be concerning the debatable question of a large, centrally located nursery versus a series of small nurseries located at or near the planting sites the fact remains the large, centrally located nursery is now and will continue to be the order of the day in Vermont for some time to come.

With us, therefore, the production of high class nursery stock in quantities adequate to the problem in hand and at prices within the reach of every land owner is the goal toward which the State nursery is moving. In our struggle to reach this goal it early became evident that the *price per thousand* at which nursery stock was sold had a decided effect upon the number of trees planted and, what is more, upon the character of land reforested. As prices came down after the war it became evident that *resident* land owners bought an ever increasing percentage of the stock sold from the nurseries and the lands planted proved to be conspicuously less agricultural. With the realization of these and other facts came an awakening to the further fact that nursery stock prices must be radically lower. To reduce the price a dollar or two would not suffice. It must be cut in half two or three

¹ Read at the annual meeting of the Society, at Boston, December 29, 1922.

times, and this was my hope when I began experimenting in new systems of nursery practice a little over three years ago. Many schemes were tried that failed but it is believed that some measure of success is about to be realized from a method of nursery practice which may be described in one short sentence: *Prune the roots of seedlings in place and cull out the inferior specimens.*

Seemingly, a plant sturdier in every way than a transplant is the result and the cost is little if any greater than the cost of ordinary seedlings. In putting this theory into operation some innovations in the mechanics of nursery practices have been worked out, and it is in the mechanics of the new system that the great saving of cost takes place.

The first innovation is in the size and shape of the seed beds which are made long and narrow—in our case 24 inches wide by 168 feet long. This width and length, however, is purely an accident. In the future a more standard width and length will be adopted. Thus far in our work with these long beds we have sown the seed and covered it as the seed is sown and covered in an ordinary Pettis bed. Also the long bed was shaded and screened and the soil received the treatment customary in the old fashioned methods of seed bed practice. Notwithstanding the fact that principles of soil treatment, sowing, covering, shading, screening, weeding, etc., were just the same in this newer method as in the older—nevertheless the cost of these operations all the way through were reduced one-third. One-year seedling will thus cost about \$1 per thousand.

As far as our present knowledge is a guide to us, root pruning should be done in the fall and can best be accomplished by passing a draw knife 5 inches or 6 inches beneath the bed. The knife, or root shear, should be a little longer than the seed bed is wide and so constructed that it will remain at a fixed depth beneath the surface of the ground. The knife, when in position, is drawn lengthwise of the bed, pruning all roots which are more than 6 inches long. The result is a fibrous root system above the point where pruning took place. (I am mindful of the fact that some authorities say such a multi-branched root system is far from ideal, but my limited experience teaches that a tree having a well branched root system succeeds where others fail.)

In the spring of the second and third years, when the seedlings are one and two years old respectively, the seed beds are gone over carefully and all the inferior specimens (inherently subdominant trees?)

snipped off with a sharp instrument not unlike a large crochet hook. I do not advocate pulling the young trees. It does damage to the root systems of those that remain. The little experience we have had in this class of work does not prove it to be costly operation; the remaining trees are thus uniformly distributed and spaced to a density of about eighty per square foot; the two or three year old stock is then practically neglected till root pruning season in the fall, when three or four men can do the root pruning in a million capacity nursery in a few days' time.

This represents the sum total of our actual experimentation. However, our plans for the future might indicate to you a little more clearly the extent to which the old nursery methods will be discarded and new ones taken up.

In the spring of 1922 we planted one-half our seed in the new-style beds to get an idea of relative costs on a large scale. We are now satisfied to put all our eggs in the new basket for there was a 33 per cent saving. Next spring it is planned to definitely and finally abandon the old-style seed bed, and the practice of transplanting will be abandoned just as soon as there are no more seedlings grown in the so-called Pettis bed. Work is now being done on a seeding drill (a grain drill in miniature) to reduce still further the cost of seeding and covering, but especially to facilitate culling and snipping at the end of the first and second years. Also, work is being done on a new design of seed bed shade and screen. It is proposed, in a small way at least, to try out an automatic shade next summer which will be so constructed and placed on the bed that the amount of direct sunlight reaching the ground beneath the screen will decrease as the sun ascends the sky and the day grows warm, and will increase with the slow descending sun. The arithmetic of the idea is simple and the proposed method of shading should do away with the handling of shade screen and thereby reduce the cost in labor and excessive deterioration of the shade and screens. The arrangement of seed beds in the future nursery has been planned to reduce the cost of stock production. It is not proposed to confine the seedling of any one year to a solid block of ground as is so frequently done now but to regularly interspace the seeding of one year with that of the previous year and the fallow space where the next year's seeding will take place. Thus the seed beds of the future will be arranged in series of four: first, a path; second, one-year seedlings; third, two-year seedlings; fourth, three-year seedlings; then a path, then one, two, three year seedlings, etc. No area will be devoted to paths beyond the bed which lies fallow. The beds are to be 30 inches wide and 125 feet long.

THE EFFECT OF BROADCAST BURNING OF SALE AREAS ON THE GROWTH OF CULL-PRODUCING FUNGI

BY JAMES R. WEIR

Forest Pathologist, U. S. Bureau of Plant Industry

The results of observations in Idaho and Montana on the effect of clean burning on the production of sporophores of cull-producing fungi considered entirely apart from any other silvicultural standpoint may be briefly summarized.

The most important cull-producing fungi found in a fruiting condition on stumps and slash on sale areas after the merchantable timber is removed, the species of tree and the kind of slash on which they are most common and the results from three and four years after the fire are as follows:

Poria subacida (form), chiefly on spruce and white pine; stumps, cull butts; not fruiting.

Poria weirii. Western red cedar; cull butts and in the duff around the stumps; completely destroyed.

Polyporus schweinitzii. Chiefly on Douglas fir, larch, white pine, spruce and in a lesser degree on other species; stumps, cull butts and in the duff. Not again observed on the areas where previously it was abundant. The fungus is more apt to appear again from infected roots at some distance from the stump than from the stump. The root crotches tend to hold the fire and the mycelium is destroyed.

Fomes pini (*Trametes pini*) on white pine, larch, Douglas fir, spruce and other species; stumps, cull logs and large branches; not fruiting.

Fomes roseus on Douglas fir; stump cull logs, not fruiting.

Fomes laricis on larch, yellow pine, Douglas fir; stump cull logs and tops; rarely fruiting from the charred ends of large cull butts.

Fomes pinicola on grand fir, larch; stumps and cull logs; fruiting occasionally. The fungus is the least important of the group.

Fomes annosus on grand fir, larch, and white pine; stump cull butts; entirely destroyed.

Echinodontium tinctorium on grand fir, lowland and mountain hemlock; cull logs; not observed to produce sporophores.

Armillaria mellea on reproduction chiefly of Douglas fir, larch and

white pine, also mature trees; on roots and debris in the duff; rarely appears after the fire.

The following points are to be considered:

The majority of the cull fungi fruit with difficulty in the open exposed conditions of a clean cut area. This does not apply to infected standing trees. Only when there is a large amount of slash and vegetation reproducing the moisture and shade conditions of the closed forest, do sporophores appear in excessive numbers on the debris of a sale area. In such a case the area of spore producing surface may be increased over that of the closed forest. This condition may be expected in the white pine belt of Idaho. The destruction of the vegetation and the smaller kinds of slash and the charring of the stump and logs prevents a return to the closed forest conditions.

Charred stumps and logs are rarely reinfected by the cull fungi of the living tree. If sporophores appear, they must in the majority of cases be produced by the living mycelium in the heartwood that did not succumb to the heat of the fire.

True saprophytic fungi such as *Trametes odorata*, *Lenzites sepiaria*, *Polystictus abietinus*, *Poria selecta*, *Poria carbonaria*, and various species of the Thelephoraceae may and do regularly infect and destroy the inner wood of charred slash. Entrance is effected through the season checks.

Since in but few types of the white pine belt may slash be expected to rot within a reasonable length of time on clean cut areas and since it is desired to reduce the fire hazard to a minimum and with all other considerations aside the evidence shows that from the standpoint of a diminution of sources of infection to standing timber broadcast burning may in some cases be considered good silviculture.

REVIEWS

A Manual Embracing the Principles Governing the Survey of Public Lands of the United States. By J. H. Ramskill and H. H. Lansing, School of Forestry, University of Montana. Published by the authors, Missoula, Montana, 1922. Pp. 57; plates, 5; 6 by 9.

The authors deserve the thanks of teachers of forest engineering and of other foresters whose work demands a knowledge of our rectangular survey system for gathering into a convenient and concise form the most essential information on the legislation, principles, and methods underlying the survey of public lands. Heretofore a teacher or student had to dig such information from fragmentary notes in texts on surveying and from the voluminous publications of the General Land Office.

There are six chapters. The first is devoted to extracts from Acts of Congress governing the survey of public lands. Chapter 2 gives a description of the division of the lands into townships, followed in the next chapter by a description of the methods of surveys of base lines, meridians, etc., townships and their subdivisions. Chapter 4, entitled "Monumentation of Surveys," describes both old and new monuments used for marking corners; their inscriptions; and the marking of survey lines between corners. Field notes are briefly described in Chapter 5, and the restoration of lost or obliterated corners in Chapter 6.

E. F.

PERIODICAL LITERATURE

SOIL, WATER, AND CLIMATE

Poor aeration of the soil is almost invariably associated with an excess of water. Movement of gases through the soil takes place primarily by diffusion. The rate of diffusion is little affected by soil structure or by weather, except that it is greatly reduced in clays and in waterlogged soils. Contrary to prevailing opinions, the author finds that a surface layer of organic matter promotes rather than retards aeration. On bare soils, torrential rains may cause a sealing of the surface pores with fine material. This condition hinders aeration, even after the soil becomes dry. A cover of leaf litter, moss or similar material prevents such action. This observation may throw light on the behavior of clay soils in northern Arizona, though here we are concerned primarily with moisture relations.

On the well-drained moraines and sandy forest soils of Sweden, aeration is no problem. Waterlogged soils of all types, on the other hand, are always liable to be poorly aerated. An excess of water is not in itself harmful to plants; the bad effect is due to a deficiency in oxygen. Drainage opens the way for the entrance of carbon dioxide. Removal of moss and litter is, from the standpoint of aeration, not only unnecessary, but in many cases positively harmful. (Summary in German.) G. A. P.

Romell, Lars-Gunnar. *Luftväxlingen i Marken som Ekologisk Faktor*. [Aeration of the soil as an ecological factor.] Med. fr. Stat. Skogsförsöks. Anst. Vol. 19, No. 2, pp. 125-359. 1922.

SILVICULTURE, PROTECTION, AND EXTENSION

This report, while prepared primarily for forest officers in government employ, contains an immense amount of material that is valuable to those studying forest fire protection. Though preliminary in character, the report justifies the conclusion that there is a vital need for more uniform laws in the various

states as to what constitute suitable spark arresters, ash pan arrangements, etc.

The report is divided into five parts: (1) Common carrier locomotives, (2) logging locomotives, (3) lumbering engines, (4) laws and regulation (only given for New York, Wisconsin, and Louisiana), and (5) recommendations and conclusions.

The most interesting part of the report is a series of 46 figures giving examples of stacks and front end arrangements, ash pans, logging locomotive spark arresters, spark arresters for donkey engines, etc.

When one considers that in 1918 419 railroads lost \$12,263,220 from 20,628 fires or \$51.10 per mile, of which 62.74 per cent were charged to sparks from locomotive stacks and chimneys on adjacent property, the need for better protection is clear.

The front-end arrangements in most common use are (1) the master mechanic front end (figures 13-14) and (2) the Mudge Slater front end (figures 15-16).

In case of logging engines the diversity of equipment is so great that the forest product laboratory recommends a series of tests to determine what arresters are efficient and serviceable. A point brought out in the report (not generally known) is that even tractor engines, operating on an increased scale in agricultural districts (page 45), may set fires. Three general types of arresters are used in tractors: (a) Screen hoods, (b) centrifugal arresters, and (c) water jacket.

The report makes it clear that the common-carrier railroads should make further experiments to determine the safest front-end arrangement. But even with a perfect machine, there will still be need of systematic expert inspection to see that the mechanical details are kept in perfect condition. Probably the most systematic government inspection on a large scale is conducted by the Canadian Railway Board with headquarters at Ottawa, Canada. Further study along the lines of this preliminary report is urgently required.

T. S. W., JR.

Spark Arresters, Ash Pans, and Forest Fires. J. S. Mathewson, the Forest Product Laboratory, Madison, Wis. Mimeographed.

Proposed Cooperative Forest Fire Insurance in Belgium

An agent of the Société Prudentia argues for the necessity of mutual forest fire insurance by owners and explains the impossibility of insuring forests under ordinary conditions and finally submits a proposition for mutual insurance if a large number of owners will join together.

Statistics are cited that while the exceptional damage in 1921 was 2,195,000 francs, the extremes between the years 1911 to 1920 were a maximum of 31,000 in 1913 and a minimum of 884 francs in 1918. There was very little insurance because the rates were practically prohibitive especially where there was a bad risk. The main reason for these high rates was that so few owners took out insurance.

An offer was made for a rate of 1.75 per thousand francs for 250,000 acres down to a rate of 0.85 if the total acreage insured amounted to 2,250,000 acres. The company asks 25 per cent of the annual deposits to cover administration, propaganda, inspection, statistics, etc.

If at least 250,000 acres could be insured, they propose to establish the following specific rates:

	Per thousand
For coppice in non-dangerous regions.....	.65
For coppice in dangerous regions.....	.75
For conifers in non-dangerous regions.....	1.75
For conifers in dangerous regions.....	1.95

with provision that poorly maintained estates should pay 15 per cent more for conifer insurance and 10 per cent more for coppice insurance beyond the rates just enumerated.

T. S. W., JR.

Bulletin de La Société Centrale Forestière, February, 1923, pages 70-83.

MENSURATION, FINANCE, AND MANAGEMENT

E. A. Smythies cites some interesting figures on *Distribution of Age and Diameter Classes* of sal (a species resembling the American chestnut oak) and shows that in a normal selection forest the volume of the "small," "average," and "large" diameter classes has a ratio of 1:3:5, like the assumption for spruce and fir, in the French method of 1883.

T. S. W., JR.

The Indian Forester, February, 1923, pages 66-69.

UTILIZATION, MARKET, AND TECHNOLOGY

The authors are manufacturers of wood tanks, and set about making experiments to remove the uncertainty in the minds of makers and users of wood tanks as to the ability of certain woods to withstand the destructive actions of certain solutions. The woods tested were bald cypress, Douglas fir, long leaf yellow pine, redwood, hard maple and white oak, and the chemicals employed included the common acids, alkalis, and salts, as well as linseed oil, turpentine, and distilled cotton seed oil fatty acids.

The tests were qualitative and included observations on taste and color imparted in the case of water, and, for the acids and oils, expansion and contraction, absorption, effect on physical nature of the wood, and effect of coatings.

E. F.

Hauser, S. J., and Bahlman, Clarence. *Effect of Chemical Solutions on Various Woods Used in Tanks*. Chem. and Met. Eng'g. 28:159-162. January 24, 1923.

Because of the evident bad faith of the Germans, who tried by every means to avoid their reparation obligations, France and Belgium have decided to exploit the state forests in the Rhine territory. A sale of about 13,000 cubic metres (3 to 4 million board feet) was made February 24 in the forest of Roetgen, near Aix la Chapelle, and other sales will soon be made, especially in the forest of Cleves. It is of especial interest to note, however, that these fellings will have due regard for the future of the forest.

T. S. W., JR.

Bulletin de La Société Centrale Forestière, February, 1923, pages 87-90.

According to A. Rodger the largest teak log ever brought out of Burma was 82.5 feet long and 10 feet in middle circumference, estimated to contain 391 cubic feet of timber and perhaps 3,000 to 3,500 board feet.

T. S. W., JR.

The Indian Forester, February, 1923, page 80.

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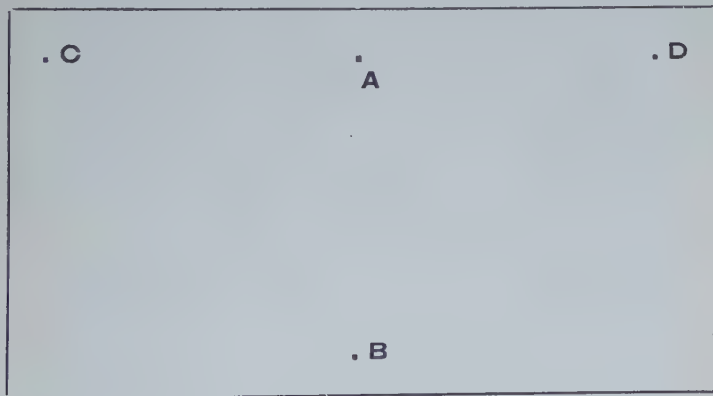
NOTES

THE ANGLE MIRROR IN FOREST MENSURATION

Having heard through more or less official channels that the Angle Mirror has been relegated along with the Aneroid Barometer and Biltmore Stick to the museum of antiquities, it might not be inappropriate to offer at this time some first-hand evidence showing that under certain conditions it still has value for field service.

The conditions I would impose would be that of a more or less level to rolling topography such as is found throughout the Coastal Plain. In this region I have found no other instrument that will so quickly and accurately enable one to lay off rectangular plots of an acre or fractions thereof in area. For plots with sides of from three to five hundred feet it is of course not practical or time saving.

Before starting out it is of course necessary to check up the angle to see that it is exactly 45 degrees. This is easily done with the aid of a transit. If a transit is not available, set up over a stake at Station A (see figure) with back sight at Station B and set stake at



C so that line AC equal AB—similarly lay off AD. If angle mirror is in adjustment the line C. A. D. will be straight.

In sample plot work accuracy is most essential, at the same time speed in this more or less mechanical part is highly desirable. For

instance, in collecting data for yield tables, the actual time consumed in laying out from 150 to 200 plots is no small part of the work.

With a crew of three men no difficulty was encountered in laying out and measuring the height and diameter of the trees on from five to six plots per day, ranging from one-quarter to one acre in area.

If the error of closure was more than 0.5 of a foot on the large plots in big timber—or more than 0.2 of a foot on the smaller plots in densely crowded young stands, the work was done over. After some practice in manipulating the mirror, the number of plots exceeding the limit of error becomes almost negligible.

Perhaps the chief time-saving element in the use of the angle mirror is the aid it gives in picking a corner that will require a minimum brushing out both ways. Having a clear path in one direction it is an easy matter to walk back and forth with hand held at right angles as a guide to picking the other line. The chance of error is also reduced by running both line A. B. and A. D. from Station A, and then making the closure on line C. D. Red flags on the corner stakes facilitate the work as they are readily picked out in the mirror.

Where the branches of the trees and undergrowth make it impossible to get a sight through at eye level it will often be found advantageous to set up close to the ground. A string run through at the same time the taping is done will show which trees are in or out—and thus a great deal of time in brushing out is saved. This of especial value in taking measurements in dense young thickets on private property where the owner might strenuously object to having avenues cut through his growing stand.

J. A. COPE,
Assistant Forester of Maryland.

IMPORTANT CHANGE IN THE CURRICULUM OF THE YALE SCHOOL OF FORESTRY

An announcement has just been made of an important change in the plan of study at the Yale School of Forestry. This change is in the direction of affording much larger freedom of election among the courses offered and of providing greater opportunities for specialized and advanced work by qualified students.

Heretofore the course has been largely along prescribed lines. Practically all the students were required to pursue the same curriculum.

Under the new plan the specific courses prescribed for all students, who are candidates for the degree of Master of Forestry, will include only those which are deemed essential for every forester, regardless of the field that he may enter. Most of the prescribed work is in the first year, and even with that there is an opportunity and the time for considerable optional work. Nearly all of the senior year is elective.

This change gives the institution more the character of a true graduate school. It lays the foundation for expansion in educational work in the various branches of forestry, and it gives special opportunities for students in research, who desire to work with the individual professors.

RESOLUTION OF THE SUPERVISORS OF DISTRICT 2, U. S. FOREST SERVICE

Whereas, Dr. Bernhard Eduard Fernow was a pioneer in the movement for the development of scientific and professional forestry in the United States, often having been fondly termed "the father of American forestry," and

Whereas, Through his thorough insight into the problems of technical forestry, his high standard of professional ethics, and his peculiarly lovable and inspiring personality, his life has been a very important factor in molding the ideals and directing the tendencies of American foresters, and

Whereas, It has pleased God to remove Dr. Fernow from our midst at this critical period in our development, when his mature judgment and wise counsel would have been of further inestimable value; therefore,

Be it resolved, By the Supervisors and other Forest officers of District 2, in meeting assembled at Denver, Colo., this 10th day of February, 1923, that we do hereby express our feeling of personal loss in the death of Dr. Fernow, and our deep appreciation of his useful and inspiring life, and

Be it further resolved, That copies of this resolution shall be transmitted to the members of Dr. Fernow's family and that the resolution shall be spread upon the minutes of this meeting.

Abstracts of a thesis by P. A. Herbert on "Standing Timber Insurance" may be obtained upon application from the Department of Forestry at Cornell University, Ithaca, N. Y.

Sample working plans for Adirondack softwoods and for Adirondack hardwoods, as prepared by A. B. Recknagel for the joint meeting of the New York Section of the Society of American Foresters and the Empire State Forest Products Association in Syracuse on November 9, may be obtained upon application from the Department of Forestry at Cornell University, Ithaca, N. Y., which has, owing to the considerable demands for them, had the plans reprinted.

John Wiley & Sons, New York, publishers of Recknagel and Bentley's "Forest Management" advise that the original printing is exhausted and that, pending a complete revision of the text in the second edition, a small supply of the first edition will be printed. This book has met with an unexpectedly large demand both at home and abroad, because it deals in a simple manner with the subjects comprising the field of forest management.

American foresters will be glad to know that a fourth revised and enlarged edition of Schlich's "Manual of Forestry, Volume I, Forest Policy in the British Empire," is now available. The large amount of statistical material presented by the British Colonies to the British Empire Conference on Forestry enabled Dr. Schlich to outline a broad forest policy for the Empire. A complete review of this volume will appear in one of the forthcoming issues of the JOURNAL.

SOCIETY AFFAIRS

REPORT ON ADMISSIONS

Augusta, Maine, February 6, 1923.

During the past year 177 persons were elected to membership in the Society. This number includes 141 Members, 28 Senior Members, and 8 Associate Members. In addition to the elections already announced in the February, March and November JOURNALS, the following were elected, effective January 1, 1923:

MEMBERS

Ames, John S.	Forsaith, Carl C.	Ottestad, Justin W.
Anderson, Lionel C.	Friend, Francis H.	Pitchlynn, Paul P.
Atwood, Charles R.	Furst, Fred W.	Radcliffe, R. H.
Averill, Robert W.	Gill, Thomas H.	Rand, Ernest A.
Averill, Walter B.	Haines, Paul B.	Richards, Harry E.
Billingslea, James H.	Harley, William P.	Rogers, Roy S.
Bird, Royal G.	Hawkins, Guy C.	Ryan, John F.
Bond, Walter E.	Hill, Robert R.	Sanderson, Wilford E.
Boomer, Stephen H.	Hine, Willard R.	Schumacher, F. X.
Brown, Lee P.	Hogue, Roy L.	Sheals, Ralph A.
Brundage, Marsden R.	Isaac, Leo A.	Slater, Charles A.
Burns, Mark L.	Ivory, Edward P.	Smith, Lawrence W.
Burrage, Clarence H.	Jones, Bryant E.	Stephens, Raymond D.
Chapman, C. W. L.	Kreutzer, William R.	Stevens, Clark L.
Cline, Albert C.	Kroodsma, Raymond F.	Stevens, Wingate I.
Cochran, Harry D.	LaMonte, Archibald D.	Stone, Everett B., Jr.
Conklin, J. S.	Lodewick, John E.	Swales, Robert D.
Curtin, George D.	Madigan, Fred H.	Swenning, Karl A.
Dain, Bryant D.	Maloy, Thomas P.	Telford, C. J.
Davis, Virgil B.	Marshall, G. E.	Volkert, Robert M.
DeLong, C. Aubrey	Mattoon, Merwin A.	Walley, James M.
Deutsch, Henry C.	Medley, J. W.	Wasilik, John, Jr.
Donery, Joseph A.	Merriam, Lawrence C.	Watkins, W. M. N.
Downs, Robert C.	Merrill, Frederic B.	Weston, J. Roland
Dutton, Walt L.	Merrill, Perry H.	Whitney, Alvin G.
Eger, B. A.	Miller, Fred H.	Whitney, Raymond L.
Ehrhart, Edmund O.	Morgan, Joseph G. G.	Woodhead, P. V.
Elliott, Joseph C.	Morris, James	Zilevitz, Reuben R.
Ericksen, Leyden N.	O'Brien, George W.	
Faulkner, George A.	Oliver, Tom K.	

SENIOR MEMBERS

Buck, C. J.
Cooper, Albert W.
Craig, Roland D.
Freedman, Louis J.
Galarneau, D. C. A.
Grose, Laurence R.

Haasis, Ferdinand W.
Hale, Warren F.
Hill, William B.
Hodgson, Allen H.
Lauderburn, Donald E.
MacMillan, Harvey R.

Morse, Howard B.
Morton, Thomas R.
Pflueger, O. W.
Wulff, John V.

ASSOCIATE MEMBERS

Craig, Horace J.
Mowry, Jesse B.

Pardee, George C.

Weaver, John E.

The Executive Council still has under consideration 9 candidates for Membership, 8 for Senior Membership, 12 for Associate Membership, and 1 for Honorary Membership. In addition to these, there are on hand nominations of 21 candidates for Membership, 28 for Senior Membership, and 1 for Associate Membership.

Two rather important questions of policy were raised in connection with the list of candidates published August 10, 1922. The first of these had to do with the eligibility for Senior Membership of foresters connected with lumber and pulp companies unless they are engaged in activities which can unquestionably be regarded as forestry. One member, for example, says, "I do not know their activities in forestry, but it is my impression that most of them are merely estimating timber or are logging superintendents, in which case they should really be elected to Associate Membership, or to stretch a point Members, but surely not Senior Members." Another member says, "I am impressed with the number of men in occupations which in themselves do not carry any guarantee as to the faith and ideals of the men in the cause of forestry nor their loyalty thereto. I refer to those particularly with the various forestry utilization industries."

The Executive Council has so far tended to be rather liberal in the election both to Membership and Senior Membership of men engaged in private work, whether for themselves or with private owners or operators or with the woodusing industries. While it has always insisted that men be actually engaged in "forest work" at the time of election, it has interpreted "forest work" freely, and has regarded it as including not only the more technical phases of silviculture and forest management, but practically any work connected with the production or utilization of forests and forest products. In addition, a

man must qualify as a "forester" before being eligible for either Membership or Senior Membership.

The Council has felt that it would be a mistake to adopt any policy which would exclude from the ranks of Senior Membership those employed by lumber and pulp companies, and that the Society would gain rather than otherwise by including in its Senior Membership men of real attainment in these occupations. It has, however, insisted on a reasonable showing of achievement, such as advancement to a position of responsibility, authorship of several publications, or some other distinct achievement. Whenever there has been any question on this score the Council has elected men in the first instance to Membership with the prospect of later advancement to Senior Membership as rapidly as their subsequent attainments justify such action. Incidentally, it may be noted that nominations for Senior Membership of men originally entering the Society as Members are becoming more frequent. This is particularly true of the names now on hand for publication, and is a healthy sign as indicating a desire not let men stagnate in the lower grade.

The other question raised had to do with the Society's policy in regard to Associate Membership. One member in commenting on the last list of candidates summed up the present situation correctly in his statement that the qualifications for Associate Members are liberal enough to make it possible for large numbers of men to be admitted from all sections of the country and thus to get in a long list from every State. He expressed the belief that this action would greatly reduce the value of Associate Membership, and added that in his opinion "only men who have shown a substantial interest in forestry far beyond the ordinary run should be taken in under this qualification unless their work is in lines which are very closely allied to forestry."

The policy of the Executive Council in the case of Associate Members has been less clear cut than in the case of Members and Senior Members, and if continued is likely to lead in time to a long and heterogeneous list of Associate Members. The Council's published statement of its attitude toward this grade is that "candidates for Associate Membership, in addition to being engaged in lines of work relating to forestry and having shown a substantial interest in American or Canadian forestry, must be rather generally known to the profession." Perhaps it is time that the Council enforced all three of

these qualifications more strictly, and particularly that relating to "substantial interest" in forestry.

The entire question was discussed at some length at the annual meeting of the Society in Boston on December 30, 1922. The concensus of opinion at that meeting was that the grade of Associate Membership serves a real and highly desirable purpose in making possible the active affiliation with the Society of men not eligible for other grades, but that the Council should scrutinize more carefully than heretofore the qualifications of candidates for Associate Membership, and should be careful to act favorably only on those engaged in lines of work closely related to forestry, and concerning the genuineness of whose interest in forestry there can be no question. It was pointed out that persons not meeting these qualifications could still be elected to Associate Membership in specific Sections under Section 3, Article 8, of the Constitution.

In accordance with the procedure adopted somewhat over a year ago the Executive Council has recently given thorough consideration to nominations for Fellowship in the Society. While there seemed to be a somewhat more favorable attitude on the part of the Council toward such nominations than was the case a year ago, the final decision was to make no nominations at this time. In addition to notifying the individual Sections of this decision, I am bringing it to the attention of the entire Society in this report in order to afford ample opportunity for the making of any nominations which may be desired by petition. I should appreciate it if any such petitions could be in my hands not later than May 1.

In connection with the discussion aroused by the recent proposals to amend the Constitution so as to allow individual Sections to elect Members and Associate Members, the following figures showing the action taken by the Executive Council on candidates proposed since the revision of the Constitution in 1917 may be of interest:

	<i>Elected</i>	<i>Rejected</i>
Members	369	18
Senior Members	179	^a 62
Associate Members	39	5
Honorary Members	3	2
Corresponding Members	3	None

^a Includes 47 men elected to Membership and 2 to Associate Membership.

Two changes of some importance in the handling of elections have been made during the past year. The papers relating to each candidate are now prepared in triplicate, so that three separate sets of papers can be circulated among the Council for action at the same time. This greatly increases the promptness with which final action on candidates can be completed. In order to facilitate the carrying out of this plan and to save copying, it will be greatly appreciated if all papers relating to candidates can be submitted in triplicate. The other change in membership procedure involves the notification of candidates by means of a form postal that they have been proposed for membership in the Society and that under the procedure in effect for election of members it is likely to be several months, and possibly longer, before action on their names is completed. They are also informed that they will be notified of the final action taken by the Executive Council either by the Secretary of the Society or by their endorsers. It is believed that this notification will be appreciated by candidates and will do away with the uneasiness which has previously sometimes developed as a result of hearing nothing from their nomination for a considerable time.

With these two changes, it would seem that the procedure on the election of new members is now on a satisfactory basis and can be handled with a minimum of delay. A thorough discussion of this question at the Boston meeting of the Society last December developed no suggestions for further improvement.

S. T. DANA,

Member of Executive Council In Charge of Admissions.

SOUTHERN APPALACHIAN SECTION MEETING

The Southern Appalachian Section of the Society of American Foresters held its winter meeting in the Chamber of Commerce rooms, Asheville, N. C., January 12, 1923, with an attendance of twenty-six. In the forenoon routine business was transacted, including the nomination of several men for membership in the Society. Among other matters, the Section went on record as being opposed to the two proposals of the California Section: (1) that members be elected directly by the Sections, and (2) that the Executive Council of the Society be composed of representatives of the Sections. The following resolution was unanimously passed:

Whereas, A number of different type classifications have been suggested for the Southern Appalachian region varying in simplicity from four types to many.

Therefore, be it resolved, That the Chairman be instructed to appoint a representative committee of five senior members to analyze the various proposals which have been made and to recommend to the profession through the Section a scheme of type classification adequate for present needs, pending the results of further scientific study; a report to be due at the next winter meeting.

W. J. Damtoft gave a resumé of the recent Boston meeting of the Society.

The following officers were elected for 1923: Chairman, Verne Rhoades; Vice-Chairman, E. F. McCarthy; Secretary, C. F. Korstian, Box 1518, Asheville, N. C.

During the afternoon the following addresses were delivered, brief discussion following the reading of each paper:

The Ultimate State Forest Fire Organization.....	G. T. Backus
The Development of the North Carolina Forest Fire Organization...	W. D. Clark
The Public, the Forest Owner, and the Forest User—Their Relative	
Responsibility for Forest Fire Prevention and Damage.....	Andrew Gennett
Forest Fire Prevention in Louisiana.....	V. H. Sonderegger
Present Day Problems in National Forest Fire Administration....	Verne Rhoades

BACK NUMBERS WANTED!

The Society wishes to get hold of a number of copies of the October, 1922, issue of the JOURNAL. Anyone who has copies to spare may send to the Secretary, Atlantic Building, Washington, D. C. The Society will pay 65 cents for each copy returned.

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